

MAT 201.2 set 2

Reg. No. ....

CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION  
APRIL 2018

**MATHEMATICS**

**PAPER II: NUMBER THEORY AND DIFFERENTIAL EQUATIONS**

Duration: 3 hours

Max Marks: 120

- Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.  
2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

**PART A**

3x10=30

1. a) If  $p$  is a prime and  $p \mid ab$ , then prove that  $p \mid a$  or  $p \mid b$ .
- b) Find the remainder when  $1! + 2! + 3! + \dots + 99! + 100!$  is divided by 12.
- c) Solve the linear congruence  $9x \equiv 21 \pmod{30}$
- d) If  $p$  is a prime then prove that  $a^p \equiv a \pmod{p}$  for any integer  $a$ .
- e) Calculate  $\phi(1001)$  where  $\phi$  is Euler's Phi function.
- f) Find the last 2 digits in  $3^{256}$  using Eulers theorem given that  $\phi(100) = 40$
- g) Prove that for the Fibonacci sequence,  $\gcd(u_n, u_{n+1}) = 1$  for every  $n \geq 1$ .
- h) Express  $\frac{19}{51}$  as a simple continued fraction.
- i) If  $x, y, z$  is a primitive Pythagorean triple, then prove that one of the integers  $x$  and  $y$  is even while the other is odd.
- j) Test for the exactness of the equation  $(6x + y^2)dx + y(2x - 3y)dy = 0$
- k) Find the integrating factor of the differential equation  
$$\frac{dy}{dx} = \operatorname{cosec} x - (\cot x)y.$$

- l) Find the velocity of escape for the moon, whose radius is 1080 miles and the acceleration due to the gravity at the surface of the moon is  $0.165g$ . (Take  $g = 6.1 \times 10^{-3} \text{ miles/sec}^2$ ).
- m) Find the general solution of differential equation  $x^2 p^2 - y^2 = 0$
- n) Obtain the p-discriminant equation of  $p^2 - xp + y = 0$
- o) Solve  $y = px + p^3$

## PART - B

### UNIT-I

2. a) State and prove fundamental theorem of Arithmetic. (6)

- b) If  $N = a_m 10^m + a_{m-1} 10^{m-1} + \dots + a_1 10^1 + a_0$  be the decimal representation of the positive integer  $N$ ,  $0 \leq a_k < 10$  and let  $S = a_0 + a_1 + \dots + a_m$ . Then prove that  $9 \mid N$  iff  $9 \mid S$ . (6)

- c) Solve the simultaneous linear congruences:

$$x \equiv 2 \pmod{13}$$

$$x \equiv 3 \pmod{5}$$

$$x \equiv 2 \pmod{7}$$

(6)

3. a) Let  $n_1, n_2, \dots, n_r$  be a set of positive integers such that the  $\gcd(n_i, n_j) = 1$  for  $i \neq j$ , then prove that the system of linear congruences

$$x \equiv a_1 \pmod{n_1}$$

$$x \equiv a_2 \pmod{n_2}$$

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$x \equiv a_r \pmod{n_r}$  has a simultaneous solution, which is unique modulo the integer  $n_1, n_2, \dots, n_r$  remove commas  $n_1 n_2 \dots n_r$  (6)

- b) If  $ca \equiv cb \pmod{n}$  then prove that  $a \equiv b \pmod{\frac{n}{d}}$  (6)

- c) Prove that  $41 \mid (2^{20} - 1)$  (6)

## UNIT-II

4. a) If  $n$  is a positive integer and  $\gcd(a, n) = 1$ , then prove that  $a^{\phi(n)} \equiv 1 \pmod{n}$  where  $\phi(n)$  is Euler's Phi function. (9)
- b) Prove that the quadratic congruence  $x^2 + 1 \equiv 0 \pmod{p}$  where  $p$  is an odd prime, has a solution iff  $p \equiv 1 \pmod{4}$ . (9)
5. a) If  $p$  is a prime, then prove that  $(p-1)! \equiv -1 \pmod{p}$  (9)
- b) Given integers  $a, b, c$  prove that  $\gcd(a, bc) = 1$  if and only if  $\gcd(a, b) = 1$  and  $\gcd(a, c) = 1$ . (9)

## UNIT-III

6. a) For  $m \geq 1, n \geq 1$  prove that  $u_{mn}$  is divisible by  $u_m$  (6)
- b) Prove that radius of the inscribed circle of a Pythagorean triangle is always an integer. (6)
- c) Prove that the  $k^{\text{th}}$  convergent of the simple continued fraction  $[a_0; a_1, a_2, \dots, a_n]$  has the value  $C_k = \frac{p_k}{q_k}, 0 \leq k \leq n$ , where
- $$p_k = a_k p_{k-1} + p_{k-2}, \quad q_k = a_k q_{k-1} + q_{k-2} \quad \text{for } k \geq 2,$$
- $$p_0 = a_0, q_0 = 1, p_1 = a_0 a_1 + 1, q_1 = a_1$$
- (6)
7. a) Prove that any rational number can be written as a simple continued fraction. (6)
- b) Prove that the area of a Pythagorean triangle can never be equal to a perfect (integral) square. (6)
- c) If  $C_k = \frac{p_k}{q_k}$  is the  $k^{\text{th}}$  convergent of the simple continued fraction  $[a_0; a_1, a_2, \dots, a_n]$  then prove that  $p_k q_{k-1} - q_k p_{k-1} = (-1)^{k-1}, 1 \leq k \leq n$ . (6)

## UNIT-IV

8. a) Solve  $(x+2y-1)dx + 3(x+2y)dy = 0$  (6)
- b) Solve  $xydx + (x^2 - 3y)dy = 0$  (6)
- c) Find the orthogonal trajectories of the family of curves  $r = a(1 + \cos \theta)$  (6)

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9. a) Solve  $(1+3x \sin y)dx - x^2 \cos y dy = 0$  (6)
- b) Solve  $y(x+y)dx + (x+2y-1)dy = 0$  by determining the integrating factor. (6)
- c) A chemical reaction takes place such that the rate of change of unconverted substance is proportional to amount of unconverted substance itself. If only one fourth of the substance has been converted at the end of 10 sec, find when  $\left(\frac{9}{10}\right)^{th}$  of the substance will have been converted. (6)

#### UNIT-V

10. a) Solve  $x^2 p^2 - 5xyp + 6y^2 = 0$  (6)
- b) Find the general and singular solution of  $xp^3 - 3yp + 9x^2 = 0$  for  $x > 0$  (6)
- c) Solve  $yy'' + (y')^2 + 1 = 0$  (6)

11. a) Solve  $(x^2 - 1)p^2 - 2xyp + y^2 - 1 = 0$  by reducing it to Clairaut's form. (6)

- b) Solve  $xy'' \neq (y')^3 - y' = 0$  (6)

- c) Solve  $xp^2 + (1-x^2)p - xy = 0$  (6)

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## CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**BOTANY**

## Paper II PLANT DIVERSITY –I

Time: 3 Hrs

Max. Marks: 80

**Instructions:**

1. Answer both Part A & Part B.
2. Answer two full questions from each unit.
3. All questions in Part B carry equal marks.
4. Draw diagrams wherever necessary.

**PART – A**

1. Answer **any TEN** of the following. 10x2=20
- a) What is Stigma? Mention any algae in which it is found?
  - b) What is Trebeculae? Where you can find it?
  - c) Write a note on Cryptoblast.
  - d) What is Carpogonium?
  - e) Write any four salient features of Bryophytes.
  - f) What are Perigonal leaves? Where they are found?
  - g) Define Protostele and mention any two types of it.
  - h) What is bifid appendage? In which plant it is found?
  - i) What is Periplasmodium? Give its significance.
  - j) What is gradate sorus? Mention the plant genera in which it occurs?
  - k) Write a brief note on stele in *Marsilea* rhizome
  - l) Mention types of fossils.

**PART – B****UNIT – I**

- Answer **any TWO** of the following. 2x10=20
2.
    - a) Describe the sexual reproduction in *Volvox* 6
    - b) Explain the assimilators in any two species of *Caulerpa* with illustration. 4
  3.
    - a) Describe auxospore formation in *Pinnularia*. 6
    - b) Explain any 2 methods of asexual reproduction in *Vaucheria*. 4
  4.
    - a) Describe Post fertilization changes in *Polysiphonia*. 6
    - b) Explain lateral conjugation in *Spirogyra*. 4

## UNIT – II

Answer **any TWO** of the following.

2x10=20

- |    |    |   |   |
|----|----|---|---|
| 5. | a) | Describe evolution of sporophytes in Bryophytes.                          | 6 |
|    | b) | Explain the primitive features in <i>Rhynia</i> .                         | 4 |
| 6. | a) | Describe the structure of capsule in <i>Funaria</i> with labeled sketch.  | 6 |
|    | b) | Explain the internal structure of <i>Riccia thallus</i> .                 | 4 |
| 7. | a) | What is synangium? Describe its role in reproduction of <i>Psilotum</i> . | 6 |
|    | b) | Write a note on economic importance of <i>Bryophytes</i> .                | 4 |

## UNIT – III

Answer **any TWO** of the following.

2x10=20

- |     |    |  |   |
|-----|----|--|---|
| 8.  | a) | With labeled sketch describe the <i>Selaginella</i> sporophyte with its cone.        | 6 |
|     | b) | Explain the T.S of stem in <i>Equisetum</i> .  | 4 |
| 9.  | a) | Describe the structure of sporophyte of <i>Pteris</i> and explain its fertile pinna. | 6 |
|     | b) | Explain the reproductive structure in <i>Ophioglossum</i> .                          | 4 |
| 10. | a) | Describe the involvement of sporocarp in the reproduction of <i>Marsilea</i> .       | 6 |
|     | b) | Explain the technique of fossil study and fossil fuels.                              | 4 |

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**CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018  
PHYSICS****Paper II: Mechanics and Thermal Physics****Duration: 3 Hrs.****Max. Marks: 80****PART – A****1. A. Answer any TEN of the following:****10×1=10**

- i) Define radius of gyration of a rigid body.
- ii) Write the expression for moment of inertia of a fly wheel.
- iii) What is the significance of the centre of mass of a system?
- iv) What is a torsion pendulum?
- v) Define linear momentum.
- vi) State the law of conservation of angular momentum.
- vii) Give the relation between gravitational constant and acceleration due to gravity.
- viii) What is a conservative force field?
- ix) Define an isothermal process.
- x) How does the melting point of wax vary with pressure?
- xi) Define entropy.
- xii) Define inversion temperature.

**B. Answer any FIVE of the following:****5×2=10**

- i) State and prove the theorem of perpendicular axes of moment of inertia.
- ii) Write a short note on Kater's pendulum.
- iii) Distinguish between elastic and inelastic collisions.
- iv) Show that in a central motion the areal velocity is a constant.
- v) Entropy increases in a natural process. Explain why?
- vi) List the application of super conductors.

**PART – B****UNIT – I****Answer any TWO of the following:**

2.
  - a) Deduce an expression for the moment of inertia of a circular disc about an axis perpendicular to its plane and hence derive the expressions for the MI of the disc about an axis passing through its diameter.
  - b) A uniform rectangular plate has mass 1.2 kg, length 15 cm and breadth 10 cm. Calculate moment of inertia about an axis passing through i) its C.G. and perpendicular to plane and ii) its one – end breadth. (6+4)
3.
  - a) Derive the formula for moment of inertia and rotational energy of a diatomic molecule.
  - b) A circular disc of mass 0.5 kg and radius 10 cm is making 60 revolutions per minute about an axis passing through its centre and perpendicular to its plane. Calculate its kinetic energy. (6+4)



4. a) What is compound pendulum? Derive an expression for the period of a compound pendulum.  
 b) The period of a bar pendulum is 1.53 s when the centre of suspension is 0.3 m from one end and 1.49 s when it is 0.2 m from the same end. If the bar is 1m long, find acceleration due to gravity. (6+4)

## UNIT – II

**Answer any TWO of the following:**

5. a) Derive an expression for the final velocity of a rocket.  
 b) A rocket is designed to attain a maximum speed of  $4.6 \text{ km s}^{-1}$ . Mass of the rocket without fuel is 100 kg. What should be the fuel if the velocity of the escaping gas is  $2 \text{ km s}^{-1}$ . (6+4)
6. a) What is a conservative field? Show that the law of conservation of energy holds good in a conservative field.  
 b) If the mass of a body is 10 kg and position vector  $\vec{r} = 2t^2\hat{i} + 5t\hat{j}$  at any instant  $t$ , find the magnitude of the angular momentum about the origin at  $t = 3 \text{ s}$ . (6+4)
7. a) Define a central field. Derive an expression for the period of vertical oscillation of a light loaded spring using the law of conservation of energy.  
 b) A vertical spring is stretched by 0.05 m when a load of 5 kg is attached to it. What will be the period of oscillation when a load of 3 kg is attached to it? (6+4)

## UNIT – III

**Answer any TWO of the following:**

8. a) Explain the term entropy. Represent the Carnot Cycle on a Temperature – Entropy diagram and prove its area represents available energy.  
 b) Calculate the work done when 1 litre of a monoatomic perfect gas at NTP is compressed adiabatically till the temperature is increased to  $100^\circ\text{C}$ . Gas constant =  $8.314 \text{ J mol}^{-1}\text{K}^{-1}$ ,  $\gamma = 1.67$  (6+4)
9. a) Deduce Clausius – Clapeyron latent heat equation and discuss the variation of boiling and melting points of liquids and solids with pressure.  
 b) Calculate the change in entropy when 1 gram of ice at  $-15^\circ\text{C}$  is converted into water at  $0^\circ\text{C}$ . Given: Specific heat of ice =  $2090 \text{ J kg}^{-1}$   
 Latent heat of fusion of ice =  $3.34 \times 10^5 \text{ J kg}^{-1}$  (6+4)
10. a) Give the theory of Joule – Thomson effect in terms of enthalpy and arrive at the condition for the cooling and heating effect of the gas.  
 b) Calculate the temperature of inversion of Helium gas.  
 Given  $a = 3.44 \times 10^{-3} \text{ N m}^4 \text{ mol}^{-2}$   
 $b = 0.0237 \times 10^{-3} \text{ m}^3 \text{ mol}$   
 $R = 8.31 \text{ J mol}^{-1} \text{ K}^{-1}$  (6+4)

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CHE 201.2

Reg. No. ....

CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**CHEMISTRY**

**PAPER II: GENERAL CHEMISTRY**

Duration: 3 hours

Max Marks: 80

- Note: 1. Write question numbers and subdivisions clearly.  
2. Write chemical equations and diagrams wherever necessary.

**PART A**

1. Answer any **TEN** of the following:

2x10=20

- What is the role of gypsum in the setting of cement?
- Mention the raw materials used in the production of  
(i) Calcium Phosphate (ii) Phosphoric acid
- Beryllium does not impart characteristic colour to the flame. Give reason.
- Explain the action of water on alkali metals.
- State the law of mass action. Show its mathematical representation.
- What is meant by rate and rate constant of a reaction?
- Calculate the half-life of a second order reaction with same  $0.5 \text{ mol dm}^{-3}$  initial concentration of the reactants and the rate constant as  $0.004 \text{ mol}^{-1} \text{ dm}^3 \text{ s}^{-1}$ .
- Give any two criteria for designing a green synthesis.
  - What is peroxide effect?
  - What is  $\text{S}_\text{N}2$  mechanism? Give example.
  - How are hydroxy compounds classified? Give one example for each type.
  - Explain Kolbe's reaction.

**PART-B  
UNIT-I**

Answer any **TWO** of the following.

10x2=20

- How is caustic soda manufactured? 04
  - Compare the ionization potential of alkali metals and alkaline earth metals. 03
  - Lithium is a good reducing agent in aqueous solution. Why? 03
- Discuss the diagonal relationship between lithium and magnesium. 04
  - How is ammonium phosphate manufactured? 03
  - Explain the manufacture of soda ash. 03
- Explain the setting of cement. 04
  - Why do alkali metals impart characteristic colours to the flame? 03
  - How is nitric acid manufactured by Ostwald's process? 03



## UNIT-II

Answer any **TWO** of the following.

10x2=20

5.
  - a) Derive Clapeyron-Clausius equation. 04
  - b) Explain the green synthesis of paracetamol. 03
  - c) How is the order of a reaction determined by half-life method? 03
6.
  - a) Derive an expression for velocity constant of a second order reaction with same initial concentration. 04
  - b) Derive van't Hoff's reaction isotherm. 03
  - c) What is atom economy? Explain with an example. 03
7.
  - a) Give 4 principles of green chemistry. 04
  - b) How is the order of a reaction determined by differential method? 03
  - c) At 1500 K, the standard free energy change  $\Delta G^\circ$  for a reaction is  $-85.02 \text{ kJ mol}^{-1}$ . Calculate the equilibrium constant for the reaction at 1500K ( $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$ ) 03

## UNIT-III

Answer any **TWO** of the following.

10x2=20

8.
  - a) Explain the orientation effect of substituents in nitrobenzene and chlorobenzene. 04
  - b) Give the mechanism of Gattermann reaction. 03
  - c) Explain the Lucas Test for distinguishing different types of alcohols. 03
9.
  - a) Explain the method of manufacture of ethanol from molasses. 04
  - b) Explain E1 mechanism with an example. 03
  - c) Explain the acidic character of Phenols. 03
10.
  - a) Give the mechanism of Claisen rearrangement. 04
  - b) How is ethylene chloride converted to ethylene glycol? 03
  - c) Explain the mechanism of addition of hydrogen bromide to propene. 03

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## CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**COMPUTER SCIENCE**  
**PAPER II – PROGRAMMING IN C**

Time: 3 Hrs

Max. Marks: 80

**PART – A**

1. Answer any TEN questions from the following:

2x10=20

- a) What is a variable? How do you declare a variable?
- b) What are symbolic constants?
- c) Differentiate i) & and && ii) / and %
- d) Differentiate between entry controlled and exit controlled looping statements.
- e) Write the syntax and purpose of any two math functions.
- f) State two advantages of user defined functions.
- g) Write the significance of null character in strings. Give example.
- h) Differentiate between structure and array.
- i) Differentiate between a macro and a variable name.
- j) Explain *fseek()* in C.
- k) What is the difference between the *malloc()* and *realloc()* functions?
- l) Write the usage of *sizeof()* operator with an example.

**PART – B**

Answer any TWO full questions from each unit.

**UNIT – I**

2. a) What are constants? Mention and explain different types of constants. (6)
- b) Explain the working of *for* loop with syntax and example. (4)
3. a) Explain the *if...else if* ladder with syntax and example. (3)
- b) Explain the different methods of initializing one dimensional array with examples. (4)
- c) With an example, explain the type conversions in C. (3)
4. a) Explain *switch* statement with syntax and example. (5)
- b) Explain formatted input and output functions with examples. (5)

**UNIT – II**

5. a) Explain any three string functions with syntax and examples. (6)

- b) Explain the following with example (4)  
i) Automatic storage Class  
ii) External storage Class
6. a) What is an user-defined function? Write its general form and give an example. (4)  
b) Create structure variable with 3 different data types. (3)  
c) With an example, explain how a union is defined. (3)
7. a) How do you create array of structure? Explain with an example. (4)  
b) What is recursion? Write a recursive functions to find the factorial of a number. (3)  
c) Explain any two categories of functions with examples. (3)

### UNIT – III

8. a) What is a pointer? How do you declare, initialize and access the pointer variable? Give an example (4)  
b) Explain the following file handling functions. (6)  
i) *getw()* ii) *ftell()* iii) *putc()*
9. a) What is a file? Explain the different modes of opening a file with examples. (5)  
b) Write a C program using pointers to find the length of a string. (5)
10. a) Explain the syntax of *fscanf()* and *fprintf()* with examples. (4)  
b) Write a note on macros. (6)

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STA 201.1

Reg. No. ....

CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**STATISTICS**

**PAPER I – DESCRIPTIVE STATISTICS & DISTRIBUTION THEORY**

Time: 3 Hrs

Max. Marks: 80

**PART - A**

Answer any TEN of the following:

10X2=20

1. a) Write down an example each for ( i) Positive Correlation (ii) Negative correlation.
- b) State whether the following statements are true or false. Give reasons.
  - i) Two independent variables are uncorrelated.
  - ii) Regression coefficients are independent of change of origin and scale.
- c) What is scatter diagram? Mention an advantage of it.
- d) Write down the normal equations for fitting an exponential curve of the form  $y = ae^{bx}$ .
- e) Explain partial correlation with an example.
- f) Prove that geometric mean of regression coefficients is the correlation coefficient.
- g) Mention any two situations, where Binomial distribution is applicable.
- h) Derive the recurrence relation between the probabilities of Poisson distribution
- i) Define Negative Binomial distribution. Mention its mean and variance.
- j) State the conditions under which Hyper geometric distribution tends to Binomial Distribution.
- k) If  $X_1$  and  $X_2$  are Poisson variates with parameters  $\lambda_1$  and  $\lambda_2$  respectively. Verify whether  $X_1 - X_2$  is also a Poisson variate.
- l) If  $X \sim B(n, p)$  Find the distribution of  $n - X$ .

**PART - B**

Answer any TWO of the following:

10x2=20

2. a) If  $X$  and  $Y$  are 2 independent variables with variance  $\sigma_x^2$  and  $\sigma_y^2$  respectively and  $r$  is the correlation Coefficient between them. If  $U = X + KY$  and  $V = X + Y \frac{\sigma_x}{\sigma_y}$  find the value of  $K$  so that  $U$  &  $V$  are uncorrelated.
- b) Derive the expression for the angle between two regression lines. When  $r = 0$  and  $r = 1$  interpret.  
(5+5)
3. a) Derive the limits for rank correlation coefficient.
- b) Show that correlation coefficient is independent of change of origin and scale.  
(6+4)



4. a) Explain the method of fitting a second degree parabola and derive the normal equation.  
 b) What is regression? Mention the properties of regression lines and coefficients. (5+5)

Answer any TWO of the following:

10x2=20

5. a) In a trivariate data, derive the equation for the plane of regression of  $X_1$  on  $X_2$  &  $X_3$ .  
 b) If  $r_{12} = r_{13} = r_{23} = \rho$ . Then show that  $r_{12.3} = r_{23.1} = r_{31.2}$  (7+3)

6. a) Derive an expression for variance of the residual of  $X_1$  based on  $X_2$  and  $X_3$   
 b) With usual notation, prove that

$$\sigma_{1.23}^2 = \sigma_1^2 \frac{\Delta}{\Delta_{11}}, \text{ where } \Delta = \begin{vmatrix} 1 & r_{12} & r_{13} \\ r_{21} & 1 & r_{23} \\ r_{31} & r_{32} & 1 \end{vmatrix} \quad (5+5)$$

7. a) With usual notations show that

$$R_{1.23}^2 = \frac{r_{12}^2 + r_{13}^2 - 2r_{12}r_{13}r_{23}}{1 - r_{23}^2}$$

- b) Show that  $b_{12.3} b_{31.2} b_{23.1} = r_{12.3} r_{31.2} r_{23.1}$  (5+5)

Answer any TWO of the following:

10x2=20

8. a) Find the MGF of Binominal distribution and hence find mean and variance of it.  
 b) Find the mode of Poisson distribution. (5+5)
9. a) State and prove Memory less property of Geometric distribution.  
 b) Find Cumulant generating function of Poisson distribution. Hence find mean and variance of it. (5+5)
10. a) Show that Negative Binomial distribution approaches Poisson distribution under certain conditions (to be stated).  
 b) Find the mean and variance of Hyper geometric distribution. (5+5)

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**CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018**  
**ZOOLOGY**

**Paper II: Zoomorphology – II**

**Duration: 3 Hrs.****Max. Marks: 80**

Note: i) Answer any TEN questions from Part A  
ii) Answer SIX questions from Part B choosing any TWO questions from each unit.

**PART – A**

**I. Answer any TEN questions:****10×2=20**

- a) Name any two representatives of Subphylum Hemichordata.
- b) What is retrogressive metamorphosis? Give an example.
- c) Give any two examples for Agnatha and Gnathostomata.
- d) Name the median fins of shark.
- e) What do you mean by Acoelous vertebra?
- f) Mention any two differences between frog and toad.
- g) Name any two non poisonous snakes.
- h) Draw a neat labeled diagram of Ichthyophis.
- i) What are synsacrum and pygostyle?
- j) Write the scientific names of house sparrow and king fisher.
- k) What is diastema? Where is it found?
- l) Give the scientific names of cat and dog.

**PART – B**  
**UNIT – I**

- II. a) Write the general characters of phylum chordata with examples. **07**  
b) Draw a neat labeled diagram of Petromyzon. **03**
- III. a) Write explanatory notes on accessory respiratory organs of fishes. **07**  
b) Make a schematic representation of classification of vertebrata up to classes giving an example for each class. **03**
- IV. a) Write any ten differences between Chondrichthyes and Osteichthyes with one example each. **05**  
b) Explain the external features of Amphioxus. **05**

**UNIT – II**

- V. a) Describe poison apparatus and biting mechanism of poisonous snakes. **07**  
b) Draw a neat labeled diagram of pelvic girdle of Frog. **03**

- VI. a) Explain the general characters of class Amphibia. Give two examples. 07  
b) Write any four salient features of order Chelonia with two examples. 03
- VII. a) Write the distinctive characters of order Apoda with an example. 05  
b) Write the differences between poisonous and non-poisonous snakes. 05

### UNIT – III

- VIII. a) Compare superorder Palaeognathae with superorder Neognathae. Give examples. 07  
b) Write any four distinctive features of Rodentia with two examples. 03
- IX. a) Give an account of the distinctive features of Protheria. 07  
b) Enumerate any four general characters of super-order Impennae with any two examples. 03
- X. a) Give an account on flight adaptation in birds. 05  
b) Describe the male reproductive system of rat. 05

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MIC 201.1

Reg. No.....

**CREDIT BASED SECOND SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018  
MICROBIOLOGY**

**Paper II: General Microbiology**

**Duration: 3 Hrs.**

**Max. Marks: 80**

**Note: Draw diagrams wherever necessary:**

**PART – A**

**I. Answer any TEN of the following:**

**2×10=20**

- a) Capsule
- b) Prophage
- c) Cyst
- d) Prokaryote
- e) Coenocytic Hyphae
- f) Mesosomes
- g) Heterocyst
- h) Ray Fungi
- i) *Wuchereria bancrofti*
- j) Pili
- k) PPLO
- l) Sandal Spike

**PART – B**

**Answer any two complete questions from each unit.**

**UNIT – I**

**(10×2=20)**

- II. a) Discuss about the cell wall in bacteria. (06)
- b) Write a note on protoplast and spheroplast. (04)
- III. a) With a neat labelled diagram explain the structure of bacterial endospore. (06)
- b) Classify bacteria with example based on the number and position of flagella. (04)
- IV. a) Explain in detail about the cytoplasmic organelles in bacteria. (06)
- b) Discuss the morphology of bacteria. (04)

**UNIT – II**

**(10×2=20)**

- V. a) Explain the general characters of Actinomycetes. (06)
- b) Write a short note on Plant Viruses. (04)
- VI. a) Explain lytic cycle in Viruses. (06)
- b) Write a note on economic importance of Rickettsia (04)
- VII. a) Discuss the general characters of Chlamydia. (06)
- b) Write a note on culturing of Mycoplasma. (04)

**UNIT – III**

**(10×2=20)**

- VIII. a) Explain the life cycle of *Plasmodium vivax* in man. (06)
- b) Write a note on the economic importance of Yeast. (04)
- IX. a) Discuss asexual method of reproduction in Fungi. (06)
- b) Write a note on Spirulina. (04)
- X. a) Discuss the general characters of Protozoa. (06)
- b) Write a note on Aspergillus. (04)

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**CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018  
ZOOLOGY****Paper IV: Endocrinology, Histology, Animal Behaviour and Applied Zoology****Duration: 3 Hrs.****Max. Marks: 80**

Note: i) Answer any TEN questions from Part A  
ii) Answer SIX questions from Part B choosing any TWO questions from each unit.

**PART – A****I. Answer any TEN of the following:****10×2=20**

- a) What is a Goitre?
- b) Write a note on HCG.
- c) Name the different histological layers of stomach.
- d) Where are crypts of Lieberkhun located?
- e) Name any two contributions of Lorenz.
- f) What is territorial behavior?
- g) Name any two types of nests in birds
- h) What is ringing experiment in birds?
- i) What are milch breeds?
- j) What are desi breeds? Give two examples of desi breeds in poultry?
- k) What is Vermiwash?
- l) Comment on fish oil.

**PART – B  
UNIT – I**

- |             |   |           |
|-------------|---|-----------|
| <b>II.</b>  | a) Give a detailed account of hormones of Adrenal gland.        | <b>07</b> |
|             | b) Write a note on Graafian follicle.                           | <b>03</b> |
| <b>III.</b> | a) Describe the histology of testis of a mammal.                | <b>07</b> |
|             | b) Write a note on gigantism.                                   | <b>03</b> |
| <b>IV.</b>  | a) Mention the functions of Prolactin.                          | <b>05</b> |
|             | b) Draw a neat labeled diagram of T.S. of pancreas of a mammal. | <b>05</b> |

**UNIT – II**

- |            |  |           |
|------------|--|-----------|
| <b>V.</b>  | a) What is learnt behavior? Give an account of different types of learnt behavior. | <b>07</b> |
|            | b) What are the advantages of animal society?                                      | <b>03</b> |
| <b>VI.</b> | a) Explain catadromous migration with an example.                                  | <b>07</b> |
|            | b) Explain parental care in Hippocampus.   | <b>03</b> |



- VII. a) Explain social organization in Monkeys. 05  
b) What is courtship behavior? Explain with any two examples. 05

### UNIT – III

- VIII. a) Write explanatory note on milk and its products. 07  
b) Write a note on deep litter system in poultry. 03
- IX. a) Explain the steps involved in culturing of pearls. 07  
b) Write a note on setting up of vermicompost bin on small scale. 03
- X. a) Distinguish between broilers and layers with two examples for each. 05  
b) Give an account of major carps. 05

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STA 401.1

Reg. No. ....

CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**STATISTICS**  
**STATISTICAL INFERENCE**

Time: 3 Hrs

Max. Marks: 80

**PART - A**

Answer any TEN of the following:

2X10=20

1. a) Define a null hypothesis and alternative hypothesis.
- b) What do you mean by Type I and Type II errors in testing of hypothesis?
- c) Briefly explain Fisher's Z transformation.
- d) State any two properties of LRTP.
- e) State Neyman-Pearson's Lemma.
- f) Define standard error of a statistic. What is the standard error of  $(p_1 - p_2)$ ?
- g) What is P-Value? How do you use it in testing of hypothesis?
- h) Give any two instances where Chi-square test is applicable.
- i) Write down the expression for constants of SPRTP.
- j) Write a note on applicability of nonparametric tests.
- k) What is the large sample approximation of median test?
- l) Write a note on Wilcoxon signed rank test.

**PART - B**

Answer any TWO of the following:

10x2=20

2. a) Define the following terms
  - i) Simple hypothesis
  - ii) Composite hypothesis
  - iii) critical region
  - iv) Power of the test
- b) If  $x \geq 1$  is the critical region for testing  $H_0: \theta = 2$  against the alternative  $\theta = 1$ , on the basis of the single observation from the population
$$H_0: f(x, \theta) = \theta e^{-\theta x}, 0 \leq x < \infty$$
Obtain the size and power of the test. (6+4)
3. a) Derive a MP test of size  $\alpha$  for testing  $H_0: \lambda = \lambda_0$  against  $H_1: \lambda = \lambda_1 (> \lambda_0)$ , in  $\lambda$  is the parameter of a Poisson distribution.
- b) Show that MP tests obtained using Neyman Pearson Lemma are unbiased. (5+5)
4. Derive LRTP for testing equality of variances of two independent normal populations whose means are unknown. (10)

Answer any TWO of the following:

10x2=20

5. a) Explain the test for correlation coefficient in a bivariate normal population with the test procedure for large sample.  
b) Explain the large sample test for testing the equality of means. (5+5)
6. a) Derive Chi-square test statistics for testing independence of attributes in a  $2 \times 2$  contingency table.  
b) Explain large sample test for single proportion. (5+5)
7. a) Derive Brandt-Snedecor formula for Chi-square test statistic for testing the independence of attributes in a  $2 \times K$  contingency table.  
b) Write a note on Yate's correction for continuity. (5+5)

Answer any TWO of the following:

10x2=20

8. a) Derive SPRTP of strength  $(\alpha, \beta)$  for testing  $H_1: P = P_0$  against  $H_1: P = P_1$  is the parameter of Bernoulli Distribution.  
b) State the advantages and disadvantages of nonparametric tests. (5+5)
9. a) Derive SPRTP for testing  $H_0: \theta = \theta_0$  against  $H_1: \theta = \theta_1$  in sampling from  $N(\theta, \sigma^2)$ , where  $\sigma$  is known.  
b) Describe the procedure in median test when there are two independent samples. (6+4)
10. a) Derive the sign test, stating clearly the assumptions made.  
b) Explain the test procedure of Mann Whitney U test. (5+5)

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## CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**COMPUTER SCIENCE****PAPER IV – JAVA PROGRAMMING AND OBJECT ORIENTED PROGRAMMING CONCEPTS**

Time: 3 Hrs

Max. Marks: 80

**PART – A**

1. Answer any TEN questions from the following:

2x10=20

- a) List any two differences between Java and C.
- b) What is conditional operator? Give an example.
- c) What is the significance of declaring a variable?
- d) What is purpose of “Super” Key word?
- e) What is a vector?
- f) Which inheritance is not supported by Java? How to overcome it?
- g) Mention any two advantages of Java.
- h) What is a class? Give an example.
- i) Define blocked state and runnable state of a thread?
- j) How does a dead state of an applet differ from a stop state?
- k) Explain the tag used to pass parameters to an applet.
- l) When do you use yield ( ) and notify ( ) methods in threads?

**PART – B**

Answer any TWO full questions from each unit.

**UNIT – I**

2. a) Explain the classification of Java statement. (5)
- b) Explain the different data types used in Java. (5)
3. a) Write a note on scope of variables. (5)
- b) Explain the while ...do loop with a suitable code example. (5)
4. a) What is an operator? Explain the different bitwise operators with examples. (4)
- b) Describe the structure of a Java Program. (6)

**UNIT – II**

5. a) List and explain any five string methods. (5)
- b) Explain how multiple inheritance is handled in Java with an example. (5)

6. a) What do you mean by method overloading? Explain. (5)  
b) Write a note on Static members. (5)
7. a) How do you declare and initialize a two dimensional array? Give an example. (4)  
b) Write any two similarities between interface and abstract class. (3)  
c) What is a constructor? State its uses. (3)

### UNIT – III

8. a) Write a short note on exceptions. (4)  
b) Explain the different stages in the life cycle of an applet. (6)
9. a) Explain the steps in creating an applet with an example. (5)  
b) Write a note on thread priorities. (5)
10. a) Explain how applet is different from an application. (5)  
b) Explain the multiple catch statement of exceptional handling. (5)

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MIC 401.1

Reg. No.....

**CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018**  
**MICROBIOLOGY**

**Paper IV: Microbial Physiology and Metabolism**

**Duration: 3 Hrs.**

**Max. Marks: 80**

**Note: Draw diagrams wherever necessary.**

**PART – A**

**I. Answer any TEN of the following:**

**2×10=20**

- a) Photosynthesis
- b) Acetyl Co A
- c) Carboxylation
- d) Acid Rain
- e) Metabolism
- f) Thylakoid
- g) Biogeochemical Cycles
- h) Phosphorylation
- i) Green House Gases
- j) NAD
- k) Chlorosomes
- l) Denitrification

**PART – B**

**UNIT – I**

**Answer any two complete questions of the following.**

**10×2=20**

- II. a) Explain the HMP pathway. (06)  
b) Write a note on Heterolactic Fermentation. (04)
- III. a) Explain the ETC. (06)  
b) Write a note on Quinones and Flavoproteins. (04)
- IV. a) Explain Gluconeogenesis. Add a note on its significance. (06)  
b) Write a note on Propionic Acid Fermentation. (04)

**UNIT – II**

**Answer any two complete questions of the following.**

**10×2=20**

- V. a) Explain Non-cyclic Photo Phosphorylation. (06)  
b) Write a note on Photoreactive Centres. (04)
- VI. a) Explain Calvin Cycle. (06)  
b) Write a note on Photosynthetic Pigments. (04)



- VII. a) With a neat illustration explain the Ultra structure of Chloroplast. (06)  
b) Differentiate between Plant and Bacterial Photosynthesis. (04)

### UNIT – III

Answer any two complete questions of the following.

10×2=20

- VIII. a) Explain the Carbon Cycle. (06)  
b) Write a note on Eutrophication. (04)
- IX. a) Explain the formation and development of Biofilms. (06)  
b) Write a note on Biocorrosion. (04)
- X. a) Write a note on Sulphur Cycle. (06)  
b) Explain the oxidation of Ammonia and Nitrate. (04)

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CHE 401.2

Reg. No. ....

CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2018

**CHEMISTRY**

**PAPER IV: GENERAL CHEMISTRY**

Duration: 3 hours

Max Marks: 80

- Note: 1. Write question numbers and subdivisions clearly.  
2. Write chemical equations and diagrams wherever necessary.

**PART A**

1. Answer any **TEN** of the following: 2x10=20

- a) Calculate the magnetic moment for  $Fe^{+3}$  ion using spin only formula.
- b) Give an example for a complex with coordination number 4 and draw the structure.
- c) Give two limitations of Valence Bond theory.
- d) Predict hybridization and geometry in  $BF_3$ .
- e) Define critical solution temperature.
- f) Give two applications of Nernst distribution law.
- g) Differentiate between adsorption and absorption.
- h) Write Freundlich adsorption isotherm and explain the terms.
- i) What is the reactant and reagent used in Hoffmann bromamide reaction?
- j) Write the equation for carbylamine reaction.
- k) What is Ziegler Natta catalyst?
- l) What are homopolymers? Give example.

**PART-B  
UNIT-I**

Answer any **TWO** of the following. 10x2=20

2.
  - a) Explain the magnetic properties of d block elements. 04
  - b) Diatomic helium molecule does not exist. Give reasons. 03
  - c) What is the difference between bonding and antibonding molecular orbital? 03
3.
  - a) Give four postulates of VSEPR theory. 04
  - b) Account for the variable oxidation state of d block elements. 03
  - c) What are the conditions for linear combination of atomic orbitals? 03
4.
  - a) What is hybridization? Explain the structure and geometry of  $SF_6$ . 04
  - b) Based on VSEPR theory, explain hybridization and shape of ammonia. 03
  - c) Draw the molecular orbital energy level diagram for  $N_2^+$  and show the filling up of electrons. Calculate the Bond order. 03

## UNIT-II

Answer any TWO of the following.

10x2=20

5. a) Explain boiling point composition curves for liquid mixtures showing positive deviation and negative deviation from Raoult's law. 04  
b) State and explain Nernst distribution law. 03  
c) Write a note on Surface films. 03
6. a) What are adsorption isotherms? Draw three different types of adsorption isotherms. 04  
b) Nitrobenzene is steam distilled. The ratio of masses of nitro benzene and water which distills over is 0.1795 at 97.42kPa pressure. If vapour pressure of nitrobenzene is 2.56 kPa. Calculate molecular mass of nitrobenzene. 03  
c) Explain the determination of surface area of an adsorbent using B.E.T. equation. 03
7. a) Explain fractional distillation of non ideal solution of Type II. 04  
b) Describe the effect of dissolved substances on the surface tension of a liquid. 03  
c) Acetic acid was shaken with  $H_2O$  and  $CCL_4$  and the following concentrations in g. mol/litre were found in 2 layers.

Water Layer	5.02	7.98	10.70
$CCL_4$ Layer	0.292	0.725	1.41

Assuming that acetic acid has single molecule in  $H_2O$ , show that it exist as a dimer in  $CCL_4$  03

## UNIT-III

Answer any TWO of the following.

10x2=20

8. a) Explain free radical polymerization of vinyl polymers. 04  
b) Explain the reactions of amines with nitrous acid. 03  
c) Write the preparation and application of epoxy resin. 03
9. a) Explain Hinsberg method to separate a mixture of primary, secondary and tertiary amines. 04  
b) Write the preparation of urea formaldehyde resin and write one application of the same. 03  
c) How do you prepare primary amines from nitriles. 03
10. a) Give a brief classification of polymers with examples. 04  
b) Explain Sandmeyer reaction. 03  
c) How is Nylon 6 manufactured? 03

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**CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018**  
**PHYSICS**

**Paper IV: Electromagnetism and Electricity**

Duration: 3 Hrs.

Max. Marks: 80

**PART – A**

**1. A. Answer any TEN of the following:**

10×1=10

- i) Define a vector field.
- ii) What is an irrotational field?
- iii) State the Faraday's law of electro-magnetic induction.
- iv) What is Poynting Vector?
- v) What is an ideal voltage source?
- vi) Define mesh of a circuit.
- vii) Write the condition for resonance of series LCR circuit.
- viii) What is a filter circuit?
- ix) Draw the diagram for delta configuration.
- x) Define capacitive reactance.
- xi) Define time constant of LR circuit.
- xii) What is a transient current?

**B. Answer any FIVE of the following:**

5×2=10

- i) Show that gradient of a scalar field is a vector.
- ii) Show that  $\nabla \cdot \vec{B} = 0$  with usual symbols.
- iii) How do you convert a current source into a voltage source?
- iv) Show that  $L/R$  has the dimension of time.
- v) Write any two differences between ac and dc.
- vi) Write any two differences between low pass and high pass filter.

**PART – B**  
**UNIT – I**

**Answer any TWO of the following:**

2×10=20

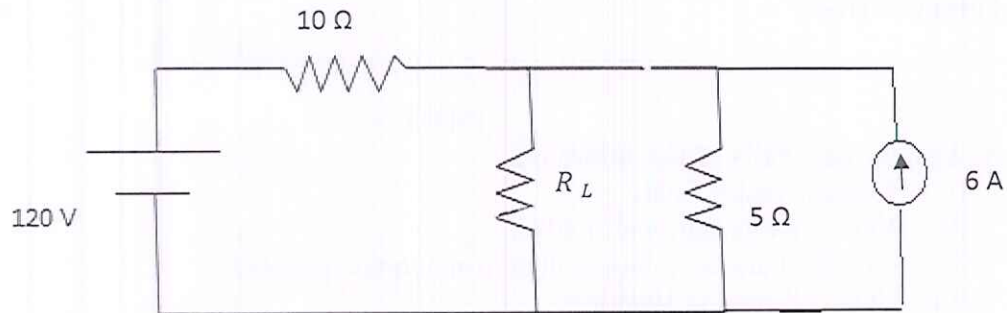
2. a) Deduce Maxwell's field equation  $\vec{\nabla} \cdot \vec{E} = \rho/\epsilon_0$  with usual symbols.  
 b) If  $\vec{A} = x^2\hat{i} + y^2\hat{j} + z^2\hat{k}$ 
  - i) is the field solenoidal
  - ii) is the field irrotational
3. a) Derive the wave equation for the field vector  $\vec{E}$  and  $\vec{B}$ . Hence arrive at the equation for the velocity of electro-magnetic waves in a medium.  
 b) If  $\vec{F} = 2xz\hat{i} - yz\hat{j} + 3xz\hat{k}$  find the divergence of curl  $\vec{F}$ .
4. a) Prove the law of energy of electromagnetic wave using Poynting theorem.  
 b) An electro-magnetic wave with a frequency of 100 MHz travels in an insulating ferrite material with the properties  $\mu = 10$ ,  $\epsilon = 1000$  at this frequency. The intensity of the wave is  $2 \times 10^{-7} \text{ Wm}^{-2}$ . What is the speed of propagation? What is the wavelength of the wave? What are the amplitudes of electric and magnetic fields in the material?  
 $c = 3 \times 10^8 \text{ m s}^{-1}$ .

## UNIT – II

Answer any TWO of the following:

2×10=20

5. a) With a general network state and explain superposition theorem.  
 b) Calculate the value of  $R_L$  which will absorb maximum power from the network. Also, compute the value of maximum power. (6+4)



6. a) Derive an expression for the growth of charge in a CR circuit and define time constant.  
 b) A circuit of resistance  $R$  ohms and inductance  $L$  Henries has a direct voltage of 230 V applied to it. 0.3 s after switching on, the current in the circuit was found to be 5 A. After the current had reached its final steady value, the circuit was suddenly short circuited. The current was again found to be 5 A at 0.3 s after short circuiting the coil. Find the value of  $R$  and  $L$ . (6+4)
7. a) Obtain an expression for the charge on the capacitor when it is discharged through series LCR circuit.  
 b) In the CR circuit, with  $R = 0.1 \text{ M}\Omega$ ,  $C = 100 \text{ }\mu\text{F}$ , 250V voltage is applied. Find the voltage across the capacitor at  $t = 3 \text{ s}$  and the time taken to dissipate 90% of the initial stored energy. (6+4)

## UNIT – III

Answer any TWO of the following:

2×10=20

8. a) Explain a series LCR circuit. Assuming the expression for the impedance in the circuit, obtain expressions for resonant frequency, quality factor and phase angle in the circuit.  
 b) A capacitor of capacitance 1000 pF is charged to a potential difference of 1 V and discharged through a B.G. The first throw on a scale placed 1m away is 62.2 cm. If time period of the B.G. coil is 10 s and logarithmic decrement is 0.02, calculate the charge sensitivity and current sensitivity of B.G. (6+4)
9. a) Give the theory of De-Sauty's bridge.  
 b) Calculate the cutoff frequency of high pass filter consisting of an 82 pF capacitor connected in series with a 240 kΩ resistor. (6+4)
10. a) Show that line voltage is  $\sqrt{3}$  times the phase voltage in star configuration.  
 b) A LCR circuit consists of  $R = 1000 \text{ }\Omega$ ,  $L = 100 \text{ mH}$  in parallel with  $C = 10 \text{ pF}$ . The applied voltage across the circuit is 100 V. Find the resonant frequency, quality factor and impedance at resonance. (6+4)

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**CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018**  
**PHYSICS**

**Paper IV: Electromagnetism and Electricity**

Duration: 3 Hrs.

Max. Marks: 80

**PART – A**

**1. A. Answer any TEN of the following:**

10×1=10

- i) State the Faraday's law of electromagnetic induction.
- ii) State the law of conservation of charge.
- iii) What is Poynting Vector?
- iv) What is anomalous dispersion?
- v) What is an ideal voltage source?
- vi) State superposition theorem.
- vii) Define rms value of a.c.
- viii) What is the power factor of a CR circuit?
- ix) What is meant by transient response of a circuit?
- x) Define cut – off frequency for a CR low pass filter?
- xi) What are eddy currents?
- xii) Define phase current.

**B. Answer any FIVE of the following:**

5×2=10

- i) Derive the equation of continuity.
- ii) Show that  $\vec{\nabla} \cdot \vec{B} = 0$  with usual symbols.
- iii) How do you convert a current source into a voltage source?
- iv) Distinguish between series and parallel resonance.
- v) What is a filter? Name the 4 types of filters.
- vi) Draw the labeled diagram for B.G.

**PART – B**  
**UNIT – I**

**Answer any TWO of the following:**

2×10=20

2.
  - a) Show that electromagnetic waves are transverse in nature.
  - b) A beam of electromagnetic wave travelling through glass prism gets dispersed into different spectral lines. The relative permittivities of yellow and violet lines are 2.856 and 2.722 respectively. Find the mean velocity of e.m. wave travelling through glass prism. (6+4)
3.
  - a) Deduce Maxwell's field equation  $\vec{\nabla} \cdot \vec{E} = \rho/\epsilon_0$  with usual symbols.
  - b) Electric potential at a region of space  $V(x, y, z) = 2x^2y - 2y^2z + 3z^2x$ . Find the components and magnitude of electric field at the point (1, -2, 2). (6+4)
4.
  - a) Deduce Maxwell's field equation  $\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$  with usual symbols.
  - b) Show that  $\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$ , if  $\vec{E} = \cos(y - t)\hat{k}$  and  $\vec{B} = \cos(y - t)\hat{i}$ . (6+4)

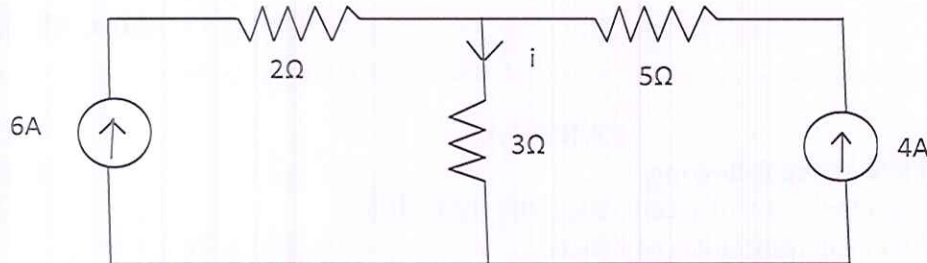


## UNIT – II

Answer any TWO of the following:

2×10=20

5. a) State and prove Maximum power transfer theorem.  
b) Using superposition theorem, find current through  $3\Omega$  resistor in the following circuit. (6+4)



6. a) Obtain the expression for current in a series LCR circuit.  
b) A series LCR circuit consists of  $50\Omega$  resistance,  $0.2\text{H}$  inductance and  $10\mu\text{F}$  capacitor with an applied voltage of  $20\text{V}$ . Determine the resonant frequency. Find the Q factor of the circuit. Compute the lower and upper half frequency limits and also find the band width of the circuit. (6+4)
7. a) Obtain the relationship between quality factor, bandwidth and sharpness of resonance.  
b) Obtain the resonant frequency and Q factor of a series LCR circuit with  $L = 5\text{H}$ ,  $C = 50\mu\text{F}$  and  $R = 15\Omega$ . What is the impedance in the circuit if it is connected to a  $220\text{V}$ ,  $50\text{Hz}$  AC supply. (6+4)

## UNIT – III

Answer any TWO of the following:

2×10=20

8. a) Derive the expression for the decay of current in a LR circuit and define time constant.  
b) A coil has an inductance of  $20\text{H}$  and a resistance of  $10\Omega$ . It is connected to a  $100\text{V}$  battery. How long will it take for the current to reach one half of the final value? (6+4)
9. a) Draw the diagram for delta configuration and give the expression for power consumed.  
b) Three  $100\Omega$  resistors are connected first in star and then in delta across a  $415\text{V}$ , 3 phase supply. Calculate the line and phase currents in each and also the power taken from the source. (6+4)
10. a) Give the theory of De-Sauty's bridge.  
b) In a balance Anderson's bridge, find the value of R and L, if  $P = 1000\Omega$ ,  $Q = 1000\Omega$ ,  $S = 500\Omega$ ,  $r = 200\Omega$  and  $C = 0.2\mu\text{F}$  (6+4)

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## CREDIT BASED FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**BOTANY****Paper IV CELL BIOLOGY, GENETICS, ANATOMY AND EMBRYOLOGY**

Time: 3 Hrs

Max. Marks: 80

**Instructions:**

1. Answer both Part A & Part B.
2. Answer two full questions from each unit.
3. All questions in Part B carry equal marks.
4. Draw diagrams wherever necessary.

**PART – A**

1. Answer **any TEN** of the following. 10x2=20
- a) Which model provides details on structure of plasma membrane? Who proposed it?
  - b) Name the non-membrane bound cell organelle.
  - c) Differentiate Euchromatin and Heterochromatin.
  - d) Which division is called as reductional division? What is the minimum ploidy level required for this?
  - e) Mention Mendel's law of inheritance.
  - f) What is epistasis? Mention any two types of it.
  - g) What are trichomes? Where do you find them?
  - h) Name the secondary thickening materials in Sclerechyma and Xylem respectively.
  - i) What is 'Open' vascular bundle? Where do you find it?
  - j) Describe Anemophily and Zoophily with suitable examples.
  - k) What is NPC? Give its significance.
  - l) Draw neat labeled diagram of mature embryo sac.

**PART – B****UNIT – I**

- Answer **any TWO** of the following. 2x10=20
2.
    - a) Give detailed account on Nucleosome model. 6
    - b) Write note on excretory products in plants. 4
  3.
    - a) Describe the ultrastructure of Mitochondrion. 6
    - b) Write a brief note on endoplasmic reticulum. 4
  4.
    - a) Describe Mitosis with its significance. 6
    - b) What is complete Linkage? Explain with suitable example. 4

## UNIT – II

Answer **any TWO** of the following.

2x10=20

- |    |    |   |   |
|----|----|---|---|
| 5. | a) | What is incomplete dominance? Explain with plant example. | 6 |
|    | b) | Give an account of structure and functions of stomata.    | 4 |
| 6. | a) | Explain Back and Test cross with suitable example.        | 6 |
|    | b) | Write a note on Sclereids.                                | 4 |
| 7. | a) | Write note on living tissues in plants.                   | 6 |
|    | b) | Describe the structure of Phloem.                         | 4 |

## UNIT – III

Answer **any TWO** of the following.

2x10=20

- |     |    |   |   |
|-----|----|---|---|
| 8.  | a) | Describe contrivances for cross Pollination.  | 6 |
|     | b) | Define i) Collateral ii) Conjoint iii) Exarch iv) Endarch with respect to vascular bundles with examples. | 4 |
| 9.  | a) | With a neat labeled diagram describe structure of anatropous ovule.                                       | 6 |
|     | b) | Explain double fertilization.   | 4 |
| 10. | a) | Explain the secondary growth in dicot stem at the stelar region.  | 6 |
|     | b) | Write a detailed note on Endosperm.   | 4 |

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MAT 202

Reg. No. ....

CREDIT BASED SECOND SEMESTER B.C.A. DEGREE EXAMINATION  
APRIL 2018

**MATHEMATICS**

**PAPER II: FUNDAMENTALS OF MATHEMATICS-2**

Duration: 3 hours

Max Marks: 80

- Note: 1. Answer any SIX questions in Part A. Each question carries 2 marks.  
2. Answer any FOUR full questions from Part B choosing ONE full question from each unit.

**PART A**

2x6=12

1. a) Define power set. Give example.  
b) If  $A = \{2, 3, 4\}$ ,  $B = \{1, 2\}$  and  $C = \{4, 5, 6\}$ , find  $A + B$  &  $A \cap C$ .  
c) Prove that  $f(x) = 2x + 1$  is a one-to-one function.  
d) Let  $f: R \rightarrow R$  be given by  $f(x) = -x^2$  and  $g: R_+ \rightarrow R_+$  be given by  $g(x) = \sqrt{x}$  where  $R_+$  is the set of non-negative real numbers and  $R$  is the set of real numbers. Is  $g \circ f$  defined?  
e) Write the truth table for biconditional statement.  
f) Write the following statement in symbolic form: "If the sun is shining today, then  $2 + 7 > 4$  and 2 is an even number."  
g) Draw a graph for directed graph and mixed graph.  
h) Define binary tree. Give example.

**PART - B**

**UNIT-I**

2. a) For any sets  $A$  &  $B$ , show that  $(A \cap B)' = A' \cup B'$  (5)  
b) Define Cartesian product of two sets. If  $A = \{1\}$ ,  $B = \{a, b\}$  &  $C = \{2, 3\}$ , find  $B \times A$ ,  $A \times B \times C$ ,  $A^2$ ,  $B^2$  and  $A \times B$ . (6)  
c) Given the relation matrices  $M_R$  and  $M_S$  find  $M_{R \circ S}$ ,  $M_{\bar{R}}$ ,  $M_{\bar{S}}$ ,  $M_{R \bar{S}}$  and show that  $M_{R \bar{S}} = M_{\bar{S} \circ \bar{R}}$  (6)

$$M_R = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$$

$$M_S = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{bmatrix}$$

3. a) Let  $A$  be a given finite set and  $P(A)$  its power set. Let  $\subseteq$  be the inclusion relation on the elements of  $P(A)$ . Draw Hasse diagram of  $(P(A), \subseteq)$  for  
 (i)  $A = \{a, b\}$  (ii)  $A = \{a, b, c\}$  (6)
- b) Represent the following sets by Venn diagram.  
 (i)  $A \cap B = \phi$  (ii)  $A - B$  (iii)  $\sim A$  (iv)  $A \cup B$  (v)  $A \subseteq B$  (5)
- c) Let  $X = \{1, 2, 3, 4\}$  &  $R = \{ \langle x, y \rangle / x > y \}$ . Draw the graph of  $R$  and also give its matrix. (6)

## UNIT-II

4. a) Let  $f(x) = x + 2$ ,  $g(x) = x - 2$  and  $h(x) = 3x$  for  $x \in R$ . Find  $g \circ f$ ,  $f \circ g$ ,  $g \circ g$ ,  $f \circ h \circ g$ ,  $h \circ g$  and  $h \circ f$  (6)
- b) Define the following terms:  
 (i) Commutative (ii) Associative (iii) Distributive (6)
- c) Let  $*$  be a binary operation on  $X$  which is associative and which has the identity  $e \in X$ . If an element  $a \in X$  is invertible, then prove that both its left and right inverses are equal. (5)
5. a) Define the following terms with an example  
 (i) Surjective function  
 (ii) Injective function  
 (iii) Bijective function. (6)
- b) Define binary operation. Prove that  $a * b = a + b + 3$ ,  $\forall a, b \in I$  is commutative and associative. (5)
- c) Define characteristic function of a set. State any three of its properties. Also show that  $\sim \sim A = A$ . (6)

## UNIT-III

6. a) Given the truth values of  $P$  and  $Q$  as T and those of  $R$  and  $S$  as F, find the truth values of the following. (6)
- (i)  $P \vee (Q \wedge R)$
- (ii)  $(P \wedge (Q \wedge R)) \vee \neg((P \vee Q) \wedge (R \vee S))$
- (iii)  $(\neg(P \wedge Q) \vee \neg R) \vee (((\neg P \wedge Q) \vee \neg R) \wedge S)$

b) Show that  $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$  (5)

c) Determine whether the following compound proposition is a tautology or a contradiction.

$$(P \rightarrow (Q \rightarrow R)) \rightarrow ((P \rightarrow Q) \rightarrow (P \rightarrow R)) \quad (6)$$

7. a) Construct the truth table for

$$\neg(P \vee (Q \wedge R)) \Leftrightarrow ((P \vee Q) \wedge (P \vee R)) \quad (5)$$

b) Define the following. Also write its truth table.

(i) Conjunction Statement (6)

(ii) Disjunction Statement

(iii) Conditional Statement

c) Determine whether the following is a tautology, contradiction or neither.

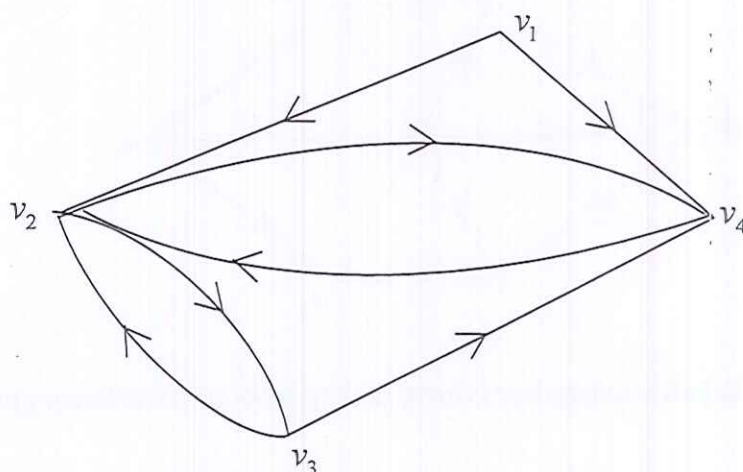
(i)  $((\neg Q \wedge P) \wedge Q)$

(ii)  $(P \rightarrow (P \vee Q))$

(iii)  $(P \Leftrightarrow Q) \Leftrightarrow ((P \wedge Q) \vee (\neg P \wedge \neg Q))$  (6)

#### UNIT-IV

8. a) Obtain the adjacency matrix A of the digraph given below. Find the elementary paths of lengths 1 and 2 from  $v_1$  to  $v_4$ . (5)



b) Define the following terms

(i) Simple path (ii) reachable (iii) strongly connected

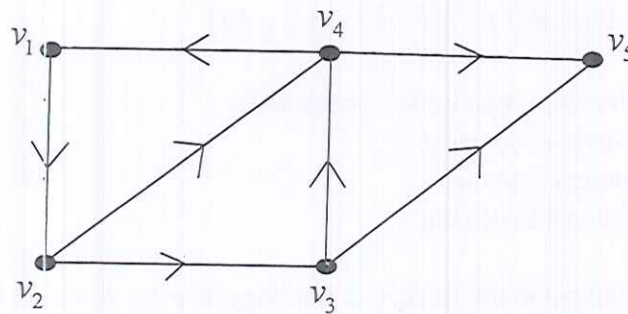
(iv) multigraph (v) Loop (vi) Cycle (6)

P.T.O.



- c) Determine whether the graph given below is strongly, weakly or unilaterally connected.

(6)



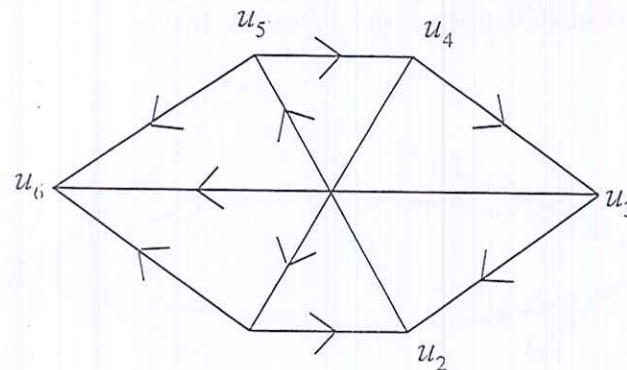
9. a) Define the following with an example.

(i) Tree (ii) Elementary path (iii) Isolated node

(6)

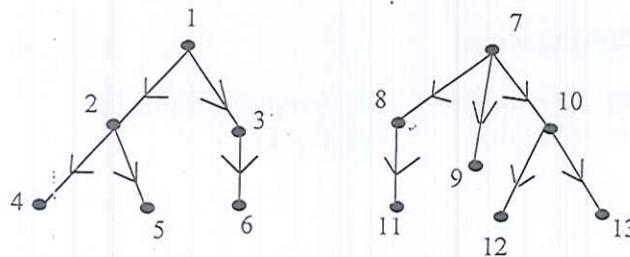
- b) Find the indegree and outdegree of all the nodes of the following graph.

(5)



- c) Obtain the binary tree corresponding to an ordered forest given below.

(6)



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## CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**MATHEMATICS****PAPER VII: PARTIAL DIFFERENTIAL EQUATIONS, VECTOR SPACES AND REAL ANALYSIS**

Duration: 3 hours

Max Marks: 120

Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.

2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

**PART A**

3x10=30

1. a) Verify the condition of integrability of the differential equation  
 $(y+z)dx + (z+x)dy + (x+y)dz = 0$
- b) Eliminate the arbitrary function from the relation  $z = f(x^2 + y^2)$
- c) Find the complete integral for the partial differential equation  $p^2 + q^2 = 4$
- d) Prove that linear span  $L(S)$  of a set of elements  $S$  of a vector space  $V$  is a subspace of  $V$ .
- e) If  $F$  is the field of real numbers then prove that the vectors  $(1, 1, 0, 0)$ ,  $(0, 1, -1, 0)$  and  $(0, 0, 0, 3)$  in  $F^{(4)}$  are linearly independent over  $F$ .
- f) If  $\{v_i\}$  is an orthogonal set of vectors in an inner product space, then show that the vectors  $v_i$  are linearly independent.
- g) Define linear transformation from a vector space  $V$  to a vector space  $W$ .
- h) Find the image of  $(3, 2)$  under the linear transformation described by  $(1, 0) \rightarrow (0, 1)$  and  $(0, 1) \rightarrow (3, 2)$
- i) If the linear transformation  $T: V \rightarrow W$  is a one to one transformation of  $V$  onto  $W$ , then prove that its inverse is linear.
- j) Determine whether the sequence  $\left\{n \sin \frac{\pi}{n}\right\}$  is convergent or divergent.
- k) Determine whether the series  $\sum_{n=1}^{\infty} \frac{3n^2 + 4}{n^2}$  is convergent or divergent.
- l) Prove that a necessary condition for convergence of  $\sum_{n=1}^{\infty} u_n$  is  $\lim_{n \rightarrow \infty} u_n = 0$ .
- m) Use the root test to determine the convergence of  $\sum_{n=1}^{\infty} \frac{1}{[\log(n+1)]^n}$
- n) Prove that the series  $\sum_{n=1}^{\infty} (-1)^n \frac{3}{n^2 + 1}$  is convergent.
- o) Find the Fourier coefficients of the periodic function  $f(x) = \begin{cases} -k & -\pi < x < 0 \\ k & 0 < x < \pi \end{cases}$ .

## PART - B

### UNIT-I

2. a) Assuming the condition of integrability solve  
 $(2x + y^2 + 2xz)dx + 2xydy + x^2dz = 0$  (6)
- b) Obtain partial differential equation of all spheres whose centres lie on the plane  $z = 0$  and whose radius is constant  $= r$ . (6)
- c) Solve  $q = xp + p^2$  (6)
3. a) Assuming the condition of integrability solve  
 $(y^2 + yz)dx + (xz + z^2)dy + (y^2 - xy)dz = 0$  (6)
- b) Solve  $(y + z)p + (z + x)q = x + y$  (6)
- c) Solve  $p^2 - y^3q = x^2 - y^2$  (6)

### UNIT-II

4. a) If  $\{v_1, v_2, \dots, v_n\}$  is a basis of  $V$  over  $F$  and if  $\{w_1, w_2, \dots, w_m\}$  in  $V$  are linearly independent then prove that  $m \leq n$ . (6)
- b) If  $V$  is a finite dimensional vector space and  $W$  is a subspace of  $V$ , then prove that  $W$  is finite dimensional and  $\dim V/W = \dim V - \dim W$  (6)
- c) If  $W$  is a subspace of an inner product space  $V$ , define  $W^\perp$  and prove that  $W^\perp$  is a subspace of  $V$ . (6)
5. a) If  $v_1, v_2, \dots, v_n$  are in a Vector space  $V$  over  $F$  then prove that either they are linearly independent or some  $v_k$  is a linear combination of its preceding ones. (6)
- b) If  $V$  is an inner product space over  $F$  then for any  $u, v \in V$  prove that  $|(u, v)| \leq \|u\| \|v\|$  (6)
- c) Prove that the set  $\{(3, -6), (4, 3)\}$  is a basis of  $R^2$ . Using this basis find an orthonormal basis of  $R^2$ . (6)

### UNIT-III

6. a) Define linear transformation.. Prove that the mapping  $T: R^2 \rightarrow R^3$  defined by  $(x, y)T = (x + y, x - y, 2z)$  is a linear transformation. (6)
- b) If  $\{\beta_1, \beta_2, \dots, \beta_m\}$  is any basis of the vector space  $V$  and  $\{\alpha_1, \alpha_2, \dots, \alpha_m\}$  are any  $m$  vectors in  $W$  then prove that there is one and only one linear transformation  $T: V \rightarrow W$  with  $\beta_1 T = \alpha_1, \beta_2 T = \alpha_2, \dots, \beta_m T = \alpha_m$ . (6)



- c) Given  $A = \begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$  Find  $A^{-1}$  by writing the rows of A as linear combination of  $I_1 = (1, 0, 0)$ ,  $I_2 = (0, 1, 0)$  &  $I_3 = (0, 0, 1)$  (6)

7. a) If the linear transformation  $T: V \rightarrow W$  is a one-one transformation of V onto W then prove that its inverse is linear (6)
- b) If  $T: V \rightarrow W$  is any linear transformation, then prove that  $\text{rank } T + \text{nullity } T = \text{dimension of } V$ . (6)
- c) Find the matrix of the linear transformation defined by  $(x, y, z) \rightarrow (x - y, x + y, 4z)$  with respect to the standard basis of  $R^3$  (6)

#### UNIT-IV

8. a) Prove that a monotonic bounded sequence is convergent. (6)
- b) Prove that  $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^2 + 4n}}$  is divergent. (6)
- c) Use the integral test to show that the series  $\sum_{n=2}^{\infty} \frac{1}{n^P}$  diverges if  $P \leq 1$  and converges if  $P > 1$ . (6)
9. a) Prove that the series  $\sum_{n=1}^{\infty} \frac{1}{n}$  is divergent. (6)
- b) If  $\sum_{n=1}^{\infty} v_n$  is a series of positive terms which is known to be convergent and  $u_n \leq v_n$  for all positive integers n, then prove that  $\sum_{n=1}^{\infty} u_n$  is convergent. (6)
- c) Determine whether the series  $\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\log n}}$  is convergent or divergent. (6)

#### UNIT-V

10. a) Show that the alternating series  $a_1 - a_2 + a_3 - a_4 + \dots$  where  $a_n > 0 \forall n$  is convergent, if
- (i)  $a_{n+1} \leq a_n \forall n$
- (ii)  $\lim_{n \rightarrow \infty} a_n = 0$  (9)
- b) Find the Fourier series of the function  $f(t) = \begin{cases} 0 & -2 < t < -1 \\ k & -1 < t < 1 \\ 0 & 1 < t < 2 \end{cases}, \quad T = 4$  (9)

11. a) Determine if the series  $\sum_{n=1}^{\infty} (-1)^n \frac{n+2}{n(n+1)}$  is absolutely convergent or conditionally convergent. (5)

b) Use ratio test to determine whether the series  $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n}{2^n}$  is convergent or divergent. (5)

c) Find the Fourier series of the periodic function,  $f(x) = x + \pi$ ,  $-\pi < x < \pi$  and  $f(x + 2\pi) = f(x)$ . (8)

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CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION  
APRIL 2018

**MATHEMATICS**

**PAPER VII: PARTIAL DIFFERENTIAL EQUATIONS, VECTOR SPACES  
AND SERIES**

Duration: 3 hours

Max Marks: 120

- Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.  
2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

**PART A**

3x10=30

1. a) Verify the condition of integrability of the differential equation  
 $(y+z)dx + (z+x)dy + (x+y)dz = 0$
- b) Eliminate a and b from  $2z = (ax+y)^2 + b$
- c) Solve  $pq = k$
- d) If  $V$  is a vector space over  $F$ , then prove that for any  $\alpha \in F$  and  $v \in V$   
(i)  $0.v = 0$  (ii)  $(-\alpha)v = -(\alpha v)$
- e) Prove that intersection of two subspaces of a vector space  $V$  is a subspace of  $V$ .
- f) Define inner product space and give an example.
- g) If  $T: R^2 \rightarrow R$  defined by  $(x, y)T = x + y$ , then prove that  $T$  is linear.
- h) If a linear transformation takes  $(1, 1)$  into  $(0, 1, 2)$  and  $(-1, 1)$  into  $(2, 1, 0)$ , what matrix represents  $T$ ?
- i) Find an eigen vector of the matrix  $A = \begin{bmatrix} -3 & 4 \\ 2 & -1 \end{bmatrix}$
- j) Determine if the sequence  $\left\{ \frac{\ln n}{n^2} \right\}$  is convergent or divergent.
- k) Determine if the sequence  $\left\{ \frac{n}{2n+1} \right\}$  is increasing or decreasing.
- l) Determine if the series  $\sum_{n=1}^{\infty} \frac{3}{2^n}$  is convergent or not.
- m) Determine whether infinite series  $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}}$  is convergent or divergent.



- n) Prove that the series  $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n}{2^n}$  is absolutely convergent.
- o) Prove that the alternating series  $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{n}$  is convergent.

## PART - B

### UNIT-I

2. a) Eliminate the arbitrary function from  $z = f\left(\frac{xy}{z}\right)$  (6)
- b) Solve  $x - p = y - q$  using Lagrange's method. (6)
- c) Solve  $p^2 + q^2 = z$  (6)
3. a) Assuming the condition of integrability, solve  
 $(yz + z^2)dx - xzdy + xydz = 0$  (6)
- b) Solve  $q = xp + p^2$  (6)
- c) Solve  $p^2 - y^3q = x^2 - y^2$  (6)

### UNIT-II

4. a) If  $v_1, v_2, \dots, v_n$  are linearly independent, then prove that every element in their linear span has a unique representation in the form  $\lambda_1 v_1 + \lambda_2 v_2 + \dots + \lambda_n v_n$  with  $\lambda_i \in F$ . (6)
- b) If  $V$  is a finite dimensional vector space, then prove that there exists a finite set  $v_1, v_2, \dots, v_n$  of linearly independent elements whose linear span is  $V$ . (6)
- c) Find an orthonormal basis for  $R^3$  from the basis  $S = \{(1, 1, 0), (0, 1, 2), (0, 0, 3)\}$  (6)
5. a) If  $v_1, v_2, \dots, v_n$  are in vectors space  $V$ , then prove that either they are linearly independent or some  $v_k$  is a linear combination of the preceding vectors  $v_1, v_2, \dots, v_{k-1}$  (6)
- b) If  $V$  is a finite dimensional vector space over a field  $F$  and if  $u_1, u_2, \dots, u_m$  are linearly independent vectors in  $V$ , then prove that there exist vectors  $u_{m+1}, u_{m+2}, \dots, u_{m+r}$  in  $V$  such that  $u_1, u_2, \dots, u_m, u_{m+1}, u_{m+2}, \dots, u_{m+r}$  is a basis of  $V$ . (6)

- c) If  $u, v \in V$ , then prove that  $|(u, v)| \leq \|u\| \|v\|$  where  $V$  is an inner product space. (6)

### UNIT-III

6. a) If  $T: V \rightarrow W$  is a linear transformation, then prove that  $\text{rank } T + \text{nullity } T = \text{dimension } V$ . (6)
- b) Define null space of a linear transformation  $T: V \rightarrow W$  and prove that it is a subspace of  $V$ . (6)

- c) Find the inverse of the matrix  $\begin{pmatrix} 1 & 0 & 3 \\ 2 & 4 & 1 \\ 1 & 3 & 0 \end{pmatrix}$  using linear transformation. (6)

7. a) If  $\beta_1, \beta_2, \dots, \beta_m$  is any basis of the vector space  $V$  and  $\alpha_1, \alpha_2, \dots, \alpha_m$  are any  $m$  vectors in  $W$ , then prove that there is only one linear transformation  $T: V \rightarrow W$  with  $\beta_1 T = \alpha_1, \beta_2 T = \alpha_2, \dots, \beta_m T = \alpha_m$ . This transformation is defined by  $(x_1 \beta_1 + x_2 \beta_2 + \dots + x_m \beta_m) T = x_1 \alpha_1 + x_2 \alpha_2 + \dots + x_m \alpha_m$ . (6)

- b) Express  $\begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}$  as a product of elementary matrices. (6)

- c) Prove that an isomorphism  $T$  of  $V$  onto  $W$  carries any set of independent vectors  $\alpha_1, \alpha_2, \dots, \alpha_r$  of  $V$  onto independent vectors in  $W$  and any set  $\beta_1, \beta_2, \dots, \beta_s$  of vectors spanning  $V$  onto vectors spanning  $W$ .

### UNIT-IV

8. a) Determine if the sequence  $\left\{ n \sin \frac{\pi}{n} \right\}$  is convergent or divergent. (6)
- b) Prove that a bounded monotonic sequence is convergent. (6)
- c) Find whether the infinite series  $\sum_{n=1}^{\infty} u_n = \sum_{n=1}^{\infty} \frac{1}{n(n+1)}$  is convergent or divergent. (6)

9. a) Prove that the sequence  $\left\{ \frac{n}{2n+1} \right\}$  has the limit  $\frac{1}{2}$  using  $\varepsilon - N$  definition. (6)
- b) If the infinite series  $\sum_{n=1}^{\infty} u_n$  is convergent, then prove that  $\lim_{n \rightarrow \infty} u_n = 0$  (6)
- c) Find whether the following two series are convergent or divergent
- (i)  $\sum_{n=1}^{\infty} \frac{n^2+1}{n^2}$  (ii)  $\sum_{n=1}^{\infty} \frac{4}{3} \left( \frac{5}{7} \right)^n$  (6)

### UNIT-V

10. a) Determine whether the infinite series  $\sum_{n=1}^{\infty} \frac{1}{(n^2+2)^{1/3}}$  is convergent or divergent. (6)
- b) Determine if the series  $\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\ln n}}$  is convergent or divergent. (6)
- c) Suppose we have alternating series  $\sum_{n=1}^{\infty} (-1)^n a_n$  where  $a_n > 0$  and  $a_{n+1} < a_n$  for all positive integers  $n$ . If  $\lim_{n \rightarrow \infty} a_n = 0$ , then prove that alternating series is convergent. (6)
11. a) Let the series  $\sum u_n$  be a series of positive terms. If  $\sum v_n$  is a series of positive terms that is known to be convergent and  $u_n \leq v_n$  for all positive integers  $n$ , then prove that  $\sum u_n$  is convergent. (6)
- b) Determine if the infinite series  $\sum_{n=1}^{\infty} \frac{1}{(n+2)^{3/2}}$  is convergent or divergent. (6)
- c) Prove that the series  $\sum_{n=1}^{\infty} (-1)^n \frac{n+2}{n(n+1)}$  is conditionally convergent. (6)



## CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**MATHEMATICS****PAPER VIII: NUMERICAL METHODS**

Duration: 3 hours

Max Marks: 120

Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.

2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

**PART A**

3x10=30

1. a) i) Round 0.0724472 correct to 4 significant figures.  
ii) Is the equation  $xe^x - \tan^{-1} x = 0$  algebraic or transcendental?
- b) i) What is the sign of  $f(a)f(b)$  if a root of  $f(x) = 0$  lies in the open interval  $(a, b)$ ?  
ii) Write the Newton-Raphson formula for finding the root of  $f(x) = 0$
- c) i) If  $f(x) = 0$  has a root with multiplicity 3, then what is the multiplicity of the root of  $f'(x) = 0$ ?  
ii) What is the condition on the tabular points in Newton forward difference formula?
- d) i) What is inverse interpolation?  
ii) For what type of interpolating points is Lagrange's formula specially used?
- e) i) What is the first forward difference of a constant?  
ii) Write Newton's backward difference interpolating formula.
- f) i) What is the degree of the interpolating polynomial which interpolates the given function of 10 tabular points?  
ii) Express  $\nabla^2 y_2$  in terms of  $y_0, y_1, y_2$ .
- g) i) Define the divided difference  $[x_0, x_1, x_2]$   
ii) Write the formula for  $\frac{dy}{dx}$  at  $x = x_0$ , when Newton's forward difference formula is used.
- h) i) What is Simpson's  $\frac{1}{3}$  Rule for  $\int_a^b f(x)dx$ , for  $n = 4$ ?  
ii) Evaluate  $\int_0^1 \frac{1}{1+x} dx$  using trapezoidal rule taking  $h = 0.5$
- i) i) Write the formula for error in trapezoidal rule to evaluate  $\int_a^b f(x)dx$ ?  
ii) In Simpson's  $\frac{3}{8}$  rule  $\int_{x_0}^{x_3} y dx = \frac{3h}{8} [y_0 + ky_1 + 3y_2 + y_3]$  then  $k = \dots\dots\dots$ ?
- j) i) When is a square matrix A said to be orthogonal?  
ii) Find the row norm of the matrix  $\begin{bmatrix} 1 & 2 & 3 \\ 5 & 4 & 6 \\ 7 & 8 & 9 \end{bmatrix}$

- k) i) Define symmetric matrix.  
ii) Write the condition for the system  $AX = B$  to be consistent?
- l) i) Under what condition does Gauss-Seidel method converge?  
ii) Which method is also known as the method of simultaneous displacements?
- m) i) Write the formula of Euler's method.  
ii) What is the order of error in Runge-Kutta method of order 4?
- n) i) In Picard's method to solve  $\frac{dy}{dx} = f(x, y)$ , the  $n^{\text{th}}$  approximation  $y_n = \dots\dots\dots$ ?  
ii) Write Runge-Kutta second order formula.
- o) i) Write Adams-Bashforth formula.  
ii) In Adams-Moulton method  $y_1^c = y_0 + \frac{y}{24} [9f_1^{(p)} + Kf_0 - 5f_{-1} + f_{-2}]$  then  $K = \dots\dots\dots$ ?

## PART - B

### UNIT-I

2. a) Describe the method of bisection. (6)
- b) Find a real root of the equation  $2x = \cos x + 3$ , correct to 3 decimal places using iteration method (Take  $x_0 = \frac{\pi}{2}$ ) (6)
- c) Using Newton Raphson method solve  $x = e^{-x}$  correct to three decimal places (Take  $x_0 = 1$ ). (6)
3. a) Using the method of iteration obtain a real root of  $x^3 + x^2 - 1 = 0$  correct to 3 decimals. (Take  $x_0 = 0.75$ ). (6)
- b) Solve  $x^3 - 4x - 9 = 0$  by the method of false position. (6)
- c) Using the generalized Newton's formula find the double root of the equation  $f(x) = x^3 - x^2 - x + 1 = 0$  (Choose  $x_0 = 0.8$ ) (6)

### UNIT-II

4. a) Derive Newton's forward interpolation formula to interpolate  $f(x)$  on the set of points  $(x_0, y_0), (x_1, y_1), \dots, (x_n, y_n)$ . (6)
- b) Using Lagrange's interpolation, resolve  $\frac{3x^2 + x + 1}{(x-1)(x-2)(x-3)}$  into partial fractions. (6)
- c) Find a cubic polynomial which takes values  $y(0) = 1, y(1) = 0, y(2) = 1, y(3) = 10$  (6)

5. a) Find  $\sqrt{155}$  from the following tabular values. (6)

x	150	152	154	156
$\sqrt{x}$	12.247	12.329	12.410	12.490

- b) Find the missing term in the following table. (6)

x	0	1	2	3	4
y	1	3	9	?	81

- c) In the table below, the values of  $y$  are consecutive terms of a series of which the number 21.6 is the 6<sup>th</sup> term. Find the 1<sup>st</sup> and the 10<sup>th</sup> terms of the series. (6)

x	3	4	5	6	7	8	9
y	2.7	6.4	12.5	21.6	34.3	51.2	72.9

### UNIT-III

6. a) Given set of tabulated points (1, -3), (3, 9), (4, 30) and (6, 132), obtain the value of  $y$  when  $x = 2$  using Newton's divided difference formula. (6)

- b) Derive trapezoidal rule to evaluate  $\int_a^b f(x) dx$ . (6)

- c) Evaluate  $\int_1^3 \frac{1}{x} dx$ , correct to 3 decimal places using Simpsons' rule with 8 strips. (6)

7. a) Find  $\frac{dy}{dx}$  for  $x = 1.2$  from the following table. (6)

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.025

- b) Given the following table find  $f(x)$  as a polynomial in  $x$  using divided difference formula: (6)

x	-1	0	3	6	7
y	3	-6	39	822	1611

- c) Obtain the approximate value of  $\pi$  from the formula  $\frac{\pi}{4} = \int_0^1 \frac{1}{1+x^2} dx$  by using Simpson's rule with 8 strips. (6)



#### UNIT-IV

8. a) Solve by Gauss-Seidel method.  
 $10x_1 - 2x_2 - x_3 - x_4 = 3$   
 $-2x_1 + 10x_2 - x_3 - x_5 = 15$   
 $-x_1 - x_2 + 10x_3 - 2x_4 = 27$   
 $-x_1 - x_2 - 2x_3 + 10x_4 = -9$  Carry out two iterations (6)
- b) Find whether the following system of equations is consistent or not.  
 $2x - 3y + 5z = 1, \quad 3x + y - z = 2, \quad x + 4y - 6z = 1$  (6)
- c) Using Gauss elimination method solve  
 $2x + y + z = 10$   
 $3x + 2y + 3z = 18$   
 $x + 4y + 9z = 16$  (6)
9. a) Find whether the following system of equation is consistent or not.  
 $x - 4y + 5z = 8$   
 $3x + 7y - z = 3$   
 $x + 15y - 11z = -14$  (6)
- b) Solve by Jacobi method.  
 $10x + y + z = 15$   
 $x + 10y + z = 24$   
 $x + y + 10z = 33$  Carry out 3 iterations (6)
- c) Describe Gauss elimination method to solve a system of linear equations. (6)

#### UNIT-V

10. a) Solve  $y' = x - y^2$ ;  $y(0) = 1$  and find  $y(0.1)$  correct to 4 decimal points by Taylor series method. (6)
- b) Using Runge-Kutta second order formula, find  $y(0.1)$  for the equation  $y' = y - x$  given  $y(0) = 2$  (6)
- c) Derive Adams-Bashforth predictor formula. (6)
11. a) Solve  $y' = 2 + \sqrt{xy}$ ,  $y(0) = 1$  and find  $y(0.1)$  and  $y(0.2)$  using modified Euler's method. (6)
- b) Given  $\frac{dy}{dx} = \frac{y-x}{y+x}$ ,  $y(0) = 1$  find  $y(0.5)$  using Range-Kutta fourth order formula ( $h = 0.5$ ) (6)
- c) Find  $y(0.8)$  using Adams-Bahsforth formula for  $y' = 1 + y^2$  with  $h = 0.2$ , given  $y(0) = 0$ ,  $y(0.2) = 0.2027$ ,  $y(0.4) = 0.4228$ ,  $y(0.6) = 0.6841$  (6)

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## CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**MATHEMATICS****PAPER VIII: GRAPH THEORY**

Duration: 3 hours

Max Marks: 120

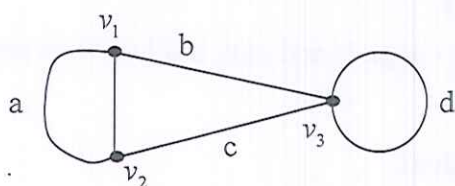
Note: 1. Answer any TEN questions in Part A. Each question carries 3 marks.

2. Answer FIVE full questions from Part B choosing ONE full question from each unit.

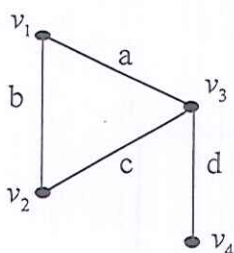
**PART A**

3x10=30

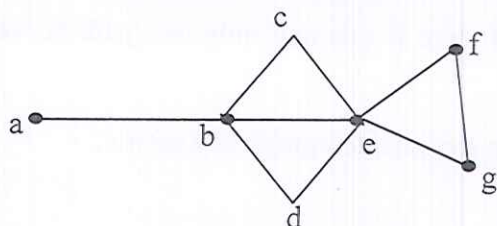
1. a) If  $p$  is the number of pendant vertices in a binary tree of  $n$  vertices, then prove that  $p = \frac{n+1}{2}$
- b) In a tree with two or more vertices, prove that there are at least two pendant vertices.
- c) Define ring sum of two graphs with an example.
- d) Prove that the vertex connectivity of any graph  $G$  can never exceed the edge connectivity.
- e) Using Euler's formula, prove that  $e \leq 3n - 6$  for a connected graph with  $n$  vertices and  $e$  edges.
- f) Write the Geometric Dual of the graph



- g) A connected graph  $G$  has 6 vertices and 9 edges. Find the rank and nullity of the graph  $G$ .
- h) Define Adjacency matrix.
- i) Write cutset matrix for the graph.

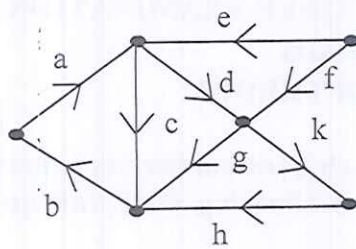


- j) Find the maximum number of ways of coloring the complete graph  $K_4$  using 6 colors.
- k) Write a maximal independent set of the graph

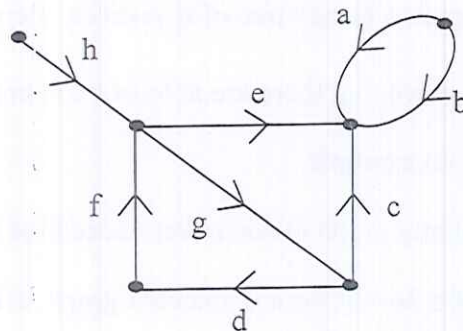


- l) Prove that a circuit with  $n$  vertices  $n \geq 3$  is 3 chromatic if  $n$  is odd.

- m) State necessary and sufficient condition for a digraph to be an Euler digraph.
- n) List all the fundamental circuits of the following digraph w.r.t. the spanning tree  $\{a, d, f, k, h\}$

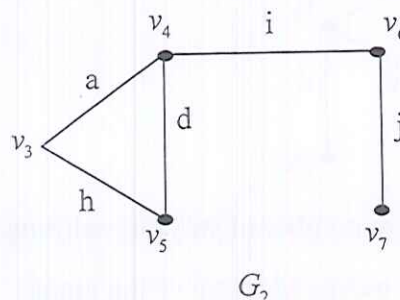
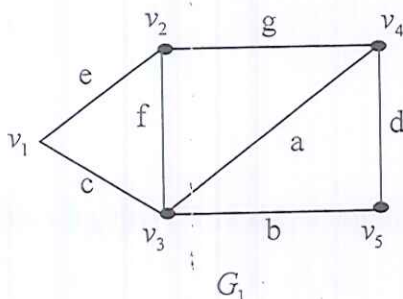


- o) Write the circuit matrix of the following graph.



## PART - B UNIT-I

2. a) Prove that a connected graph  $G$  is an Euler Graph if and only if all vertices are of even degree. (6)
- b) Prove that a tree with  $n$  vertices has  $n - 1$  edges. (6)
- c) Prove that a simple graph with  $n$  vertices and  $k$  components can have at most  $\frac{(n-k)(n-k+1)}{2}$  edges. (6)
3. a) Find  $G_1 \oplus G_2$ ,  $G_1 \cup G_2$ ,  $G_1 \cap G_2$  for the following graphs. (6)

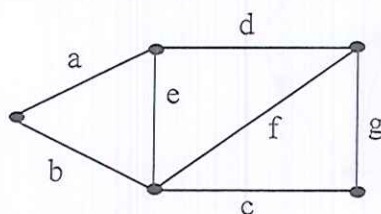


- b) Prove that a graph is a tree if and only if there is one and only one path between every pair of vertices. (6)
- c) Prove that distance between the vertices in a connected graph is a metric. (6)



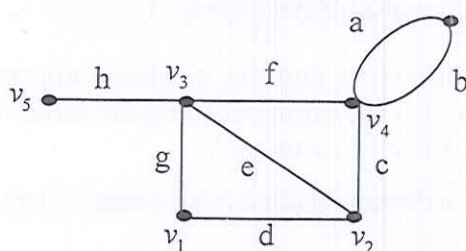
## UNIT-II

4.
  - a) With respect to a spanning tree  $T$ , prove that a branch  $b_i$  that determines a fundamental cutset  $S$  is contained in every fundamental circuit associated with the chord in  $S$  and in no other. (6)
  - b) Prove that  $K_{3,3}$  is not planar. (6)
  - c) Prove that every circuit has an even number of edges common with any cutset. (6)
5.
  - a) If a connected graph having  $n$  vertices and  $e$  edges is planar, then prove that it has  $e - n + 2$  regions. (6)
  - b) State the Algorithm for constructing dual of a graph. (6)
  - c) Define fundamental cutset of a graph. Write all fundamental cutsets of the following graph with respect to the spanning tree  $\{a, b, c, d\}$  (6)



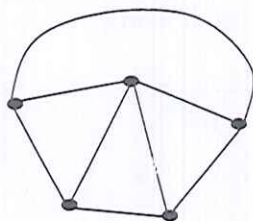
### UNIT-III

6.
  - a) Prove that the ring sum of two circuits is either a circuit or an edge disjoint union of circuits. (6)
  - b) Prove that the rank of an incidence matrix is  $n - 1$  where the graph has  $n$  vertices. (6)
  - c) If  $A$  and  $B$  are the incidence matrix and circuit matrix of a connected graph  $G$ , then prove that  $AB^T = BA^T \equiv 0 \pmod{2}$ . (6)
7.
  - a) In the vector space of a graph, prove that the circuit subspace and cutset subspaces are orthogonal to each other. (6)
  - b) Prove that the rank of the circuit matrix is  $e - n + 1$  where  $e$  is the number of edges and  $n$  is the number of vertices in a graph  $G$ . (6)
  - c) Define incidence matrix of a graph. Write the incidence matrix of the following graph. (6)



## UNIT-IV

8. a) Prove that a graph on  $n$  vertices is a complete graph if and only if its chromatic polynomial is  $P_n(\lambda) = \lambda(\lambda-1)(\lambda-2)\cdots(\lambda-n+1)$  (6)
- b) Prove that a graph with at least one edge is 2 chromatic if and only if it has no circuit of odd length. (6)
- c) Let  $a$  and  $b$  be two non adjacent vertices in a graph  $G$ . Let  $G'$  be a graph obtained by adding an edge between  $a$  and  $b$ . Let  $G''$  be the simple graph obtained from  $G$  by fusing the vertices  $a$  and  $b$  together and replacing sets of parallel edges with a single edge. Prove that  $P_n(\lambda)$  of  $G = P_n(\lambda)$  of  $G' + P_{n-1}(\lambda)$  of  $G''$ . (6)
9. a) Prove that the chromatic polynomial of a tree having  $n$  vertices is  $P_n(\lambda) = \lambda(\lambda-1)^{n-1}$  (6)
- b) Prove that every tree with two or more vertices is 2-chromatic. (6)
- c) Find the chromatic polynomial of the following graph. (6)



## UNIT-V

10. a) Prove that an arborescence is a tree in which every vertex other than the root has an in-degree of exactly one. (6)
- b) Draw the digraph for the incidence matrix.
 

	a	b	c	d	e
$v_1$	0	1	0	1	0
$v_2$	1	-1	1	0	0
$v_3$	-1	0	0	-1	1
$v_4$	0	0	-1	0	-1

 (6)
- c) If  $A$  is the incidence matrix of a digraph then prove that every square submatrix of  $A$  has determinant 1, -1, or 0. (6)
11. a) Let  $A_f$  be the reduced incidence matrix of a connected digraph. Then prove that the number of spanning trees in the graph equals the value of  $\det(A_f \cdot A_f^T)$ . (6)
- b) Let  $B$  and  $A$  respectively be the circuit matrix and the incidence matrix of a self loop free digraph such that the columns of  $B$  and  $A$  are arranged using the same order of edges. Then prove that every row of  $B$  is orthogonal to every row of  $A$ . (6)
- c) In an arborescence, prove that there is a directed path from the root to every other vertex. (6)

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BOT 601.2

Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**BOTANY**

**PAPER VII – PLANT BIOTECHNOLOGY**

Time: 3 Hrs

Max. Marks: 80

**Instructions:**

1. Answer both Part A & Part B.
2. Answer two full questions from each unit.
3. All questions in Part B carry equal marks.
4. Draw diagrams wherever necessary.

**PART – A**

1. Answer any TEN of the following. 10x2=20
- a) What is chaptelization? What is its significance.
  - b) List the criteria for selection of explants.
  - c) Briefly explain any 2 surface sterilization methods.
  - d) What is restriction digestion?
  - e) What are flavr-savr tomatoes?
  - f) What is de-differentiation?
  - g) What are vectors? Give any 2 features of vectors.
  - h) What is cDNA?
  - i) Mention 2 uses of citric acid.
  - j) What is the difference between Patent and copyright?
  - k) Write the significance of Pollen culture.
  - l) Explain shotgun method.

**PART – B**

**UNIT – I**

- Answer any TWO of the following. 2x10=20
2. a) How do you obtain hybrids and cybrids? Mention its merits. 6  
b) Describe the aseptic techniques involved in preparation of a stem cutting as an explant. 4
  3. a) Give a general account on organogenesis. 6  
b) Describe the process of Meristem culture and its significance. 4
  4. a) Give a detailed account on suspension culture. 6  
b) What are the hormones required in plant tissue culture? Write its significance. 4



## UNIT – II

Answer **any TWO** of the following.

2x10=20

5. a) How do you prepare synthetic seeds? Mention its uses. 6  
b) Describe the construction and features of P<sup>BR322</sup>. 4
6. a) What are the techniques used to screen the transformed cells? Describe any one technique 6  
b) Write the two types of restriction enzymes and its significance. 4
7. a) Write the Mechanism of Somaclonal variations. 6  
b) Write a note on i) taq polymerase ii) DNA ligase 4

## UNIT – III

Answer **any TWO** of the following.

2x10=20

8. a) Mention any 4 types of fermentation techniques based on substrate and explain any one. 6  
b) How do you develop golden rice? Explain the mechanism. 4
9. a) Explain the process of preparation of Vit – B12. 6  
b) Differentiate chemostat and turbidostat. 4
10. a) Describe a technique to generate herbicide resistant plants through genetic engineering. 6  
b) Write a note on Intellectual property rights (IPR) 4

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## CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**BOTANY****Paper VIII ENVIRONMENTAL BIOLOGY & BIOMETRICS**

Time: 3 Hrs

Max. Marks: 80

**Instructions:**

1. Answer both Part A & Part B.
2. Answer two full questions from each unit.
3. All questions in Part B carry equal marks.
4. Draw diagrams wherever necessary.

**PART – A**

1. Answer **any TEN** of the following. 10x2=20
- a) What are nest epiphytes?
  - b) What are succulents? Give an example?
  - c) Define food web.
  - d) What are Heliophytes?
  - e) What is pollution?
  - f) Define bioremediation.
  - g) Write any two effects of acid rain on vegetation.
  - h) What is invasion?
  - i) Expand the term 'NEERI'
  - j) What is meant by Standard Deviation?
  - k) What is noise pollution?
  - l) Define biodiversity hot spot.

**PART – B****UNIT – I**

- Answer **any TWO** of the following. 2x10=20
2.
    - a) Give an account of morphological adaptations of Hydrophytes. 6
    - b) Explain any four effects of wind on vegetation. 4
  3.
    - a) Describe the positive interactions of biotic factors. 6
    - b) Explain i) Vivipary ii) Velamen 4
  4.
    - a) Give a detailed account of pond ecosystem. 6
    - b) Write note on ecological pyramids. 4

**UNIT – II**

- Answer **any TWO** of the following. 2x10=20
5.
    - a) Describe the different steps of Xerosere with examples. 6
    - b) Write a note on i) Green house effect ii) PAN. 4

6. a) Give an account of i) Moist Deciduous forest ii) Evergreen forest 6  
 b) Write a note on i) Sedge Meadow Stage ii) Reed Swamp Stage 4
7. a) Explain the effects of water pollution. 6  
 b) Write note on Bio Gas production. 4

### UNIT – III

Answer **any TWO** of the following.

**2x10=20**

8. a) Give an account of any four control methods of soil erosion. 6  
 b) Write a short note on Alternative energy sources. 4
9. a) Describe methods of conservation of forest. 6  
 b) Explain the rain water harvest methods for urban area. 4
10. a) The following tables gives production yield in Kg per hectare of maize of 160 families in a village.  
 Calculate the Mean values 6

Production Yield Kg Per Hectar	50-53	53-56	56-59	59-62	62-65	65-68	68-71	71-74	74-77
Families	5	10	14	30	36	28	16	13	07

- b) Write a note on Red Data book and IUCN 4

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## CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

## PHYSICS

## Paper VII: Electronics

Duration: 3 Hrs.

Max. Marks: 80

## PART – A

## 1. A. Answer any TEN of the following:

10×1=10

- Why emitter of a transistor is heavily doped?
- Name the different configurations of a transistor.
- Why FET is a voltage controlled device?
- Define voltage regulation as applied to rectifiers.
- Why is it desirable to have the operating point in the middle of load line in amplifiers?
- Define input offset voltage of an OPAMP
- What is common mode rejection ratio?
- Write the formula for the gain of a feedback amplifier.
- What is a Serial shift register?
- If  $y = \overline{AB}$  and  $A = 0$ ,  $B = 1$ . Find  $Y$ .
- What is the need for modulation?
- What type of modulation is adopted for audio signals in TV transmission?

## B. Answer any FIVE of the following:

5×2=10

- How does a resistor in the emitter circuit stabilize the operating point?
- Draw the diagram of a transistor series voltage regulator.
- Explain briefly CC amplifier.
- What are the ideal characteristics of an OPAMP?
- Write the logic circuit of XOR gate and give its truth table?
- What is the significance of PRESET and CLEAR inputs?

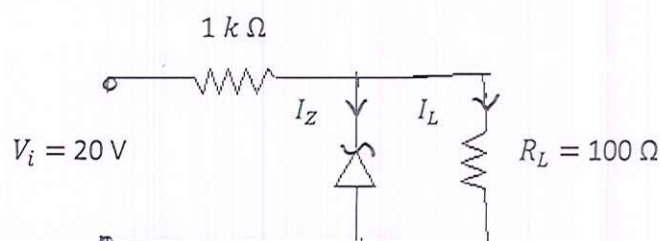
## PART – B

## UNIT – I

## Answer any TWO of the following:

2×10=20

- Describe voltage divider biasing method for a transistor with suitable diagram and explain how stabilization of operating point is achieved.
  - A transistor uses a voltage divider bias. Use the following data and calculate the value of collector current and collector to emitter voltage.  $R_1 = 56 \text{ k}\Omega$ ,  $R_2 = 15 \text{ k}\Omega$ ,  $R_C = 1 \text{ k}\Omega$ ,  $R_E = 1 \text{ k}\Omega$ . Assume  $V_{BE} = 0.7 \text{ V}$ ,  $\beta = 100$ ,  $V_{CC} = 15 \text{ V}$  (6+4)
- With a neat diagram explain the working of a bridge rectifier.
  - Input voltage of a bridge rectifier is  $20 \text{ V}_{\text{rms}}$ ,  $50 \text{ Hz}$ . Calculate the i) dc output voltage ii) Rectification efficiency iii) Peak inverse voltage i) output frequency. Assume  $r_f = 10 \Omega$  (6+4)
- Explain the working of n – channel JFET. Draw the necessary structural diagram.
  - Find the i) value of  $V_Z$  ii) load current  $I_L$  and iii) Zener current  $I_Z$ , in the following circuit. Given  $V_0 = 6 \text{ V}$ . (6+4)



## UNIT – II

**Answer any TWO of the following:**

**2×10=20**

5. a) Explain the frequency response of an amplifier in CE-mode. Explain briefly the effect of various capacitors at low frequency range.  
 b) A transistor amplifier with  $R_1 = 47 \text{ k}\Omega$ ,  $R_2 = 15 \text{ k}\Omega$ ,  $R_C = 1 \text{ k}\Omega$ ,  $R_E = 1 \text{ k}\Omega$ ,  $R_L = 1 \text{ k}\Omega$ ,  $V_{CC} = 12\text{V}$ ,  $V_{BE} = 0.7\text{V}$ ,  $\beta = 100$ . Draw the dc and ac load line and determine the operating point. (6+4)
  
6. a) With a neat diagram, explain the working of a Wein bridge oscillator.  
 b) An inverting OPAMP uses  $R_1 = 10 \text{ k}\Omega$ ,  $R_2 = 47 \text{ k}\Omega$ . Calculate the output voltage, if the input is  $-0.5 \text{ V}$ . What is the output voltage if the input voltage is doubled? (6+4)
  
7. a) What is meant by non-inverting amplifier? How OPAMP can be used as non-inverting amplifier. Derive expression for its voltage gain and mention the values of input and output resistances.  
 b) A Wein bridge oscillator uses  $R = 1 \text{ k}\Omega$  and  $C = 0.4 \text{ }\mu\text{F}$  in its lead lag network. Calculate the value of frequency of oscillation. Calculate the values of frequency if the value of resistance R is doubled. (6+4)

## UNIT – III

**Answer any TWO of the following:**

**2×10=20**

8. a) Realise OR, AND and NOT gates using NAND gates.  
 b) An AM wave is represented by  $v = 10 (1 + 0.5 \cos 3140 t) \sin 211 \times 10^4 t$   
 i) What are the minimum and maximum amplitudes of AM wave?  
 ii) Calculate the frequency component and amplitude component of the wave. (6+4)
  
9. a) What is a shift register? Explain the working of a Serial shift register using D flipflop.  
 b) An AM broadcast transmitter has a power of 30 kW, with modulation index 0.6. Calculate the power of the carrier wave. (6+4)
  
10. a) Describe FM radio transmitter with block diagram.  
 b) Simplify  $Y = \bar{A}\bar{B}C + \bar{A}B\bar{C} + A\bar{B}\bar{C} + ABC$  and draw the logic circuit for the simplified expression. (6+4)

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**CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018**  
**PHYSICS**

**Paper VIII: Nuclear Physics**

Duration: 3 Hrs.

Max. Marks: 80

**PART – A**

**1. A. Answer any TEN of the following:**

10×1=10

- i) Which experiment confirmed the existence of nucleus?
- ii) Give examples for mirror nuclei.
- iii) What is a thermonuclear reaction?
- iv) Name the first Indian nuclear reactor.
- v) What is radioactive equilibrium?
- vi) Write the relation between range and energy.
- vii) Which is the starting element of neptunium series?
- viii) What are transuranic elements?
- ix) How does a cyclotron differ from a LINAC?
- x) What is east-west effect?
- xi) What is annihilation of matter?
- xii) What are Quarks?

**B. Answer any FIVE of the following:**

5×2=10

- i) Write the characteristics of nuclear forces.
- ii) What is a magnetic bottle? Where is it used?
- iii) State and explain Geiger-Nuttall rule.
- iv) Give one example each for  $(\alpha, n)$  and  $(\alpha, p)$  reaction.
- v) Explain cosmic ray shower.
- vi) Write the applications of a Betatron.

**PART – B**  
**UNIT – I**

**Answer any TWO of the following:**

2×10=20

2. a) Explain Yukawa's meson field theory and explain how the rest mass of a meson can be estimated using uncertainty principle.  
 b) Calculate the power output of a nuclear reactor which consumes 2kg of  $U^{235}$  per day. The average energy released per fission of  $U^{235}$  nuclei is 200 MeV. (6+4)
3. a) Obtain the expression for nuclear mass of a nucleus based on liquid drop model.  
 b) The atomic mass of  ${}_{10}Ne^{20}$  isotope is 19.992 amu. Calculate its binding energy with the prediction of liquid drop model. Given the set of coefficients:  $a_v = 14.1MeV, a_s = 13.0MeV, a_c = 0.595MeV, a_a = 19.0MeV, a_p = 33.5MeV$ . (6+4)
4. a) Deduce the four factor formula for a nuclear reactor.  
 b) It is proposed to produce 100MW of electrical power on an average in a nuclear reactor having 15% efficiency, using U-235. Calculate the amount of U – 235 required per day for continuous operation.  
 [Given: Energy released per fission of U – 235 is 200 MeV] (6+4)



## UNIT – II

**Answer any TWO of the following:**

**2×10=20**

5. a) With elements A, B and C forming a radioactive series, derive an expression for the number of atoms of B if at start B was not present in the sample.  
 b) The activity of a radioactive sample drops to  $\frac{1}{16}$ th of its initial value in 1 hour 20 minutes. What is the half life? (6+4)
  
6. a) Which are the paradoxes of Beta ray spectra? Explain these on the basis of Pauli's neutrino hypothesis. Also briefly explain the neutrino hypothesis of  $\beta$  – decay.  
 b) Calculate the range and energy of  $\alpha$  particles moving with a velocity of  $2 \times 10^7 \text{ ms}^{-1}$ . (6+4)
  
7. a) What is Q value and threshold energy of a nuclear reaction? Derive an expression for threshold energy of a nuclear reaction.  
 b) Calculate the threshold energy required to initiate the reaction  $N^{14}(\alpha, p)O^{17}$   
 Given: *Mass of  $N^{14} = 14.00324 \text{ amu}$*   
           *Mass of  $O^{17} = 16.99913 \text{ amu}$*   
           *Mass of  $\alpha$  particle = 4.00260 amu*  
           *Mass of proton = 1.00783 amu* (6+4)

## UNIT – III

**Answer any TWO of the following:**

**2×10=20**

8. a) Describe the theory and arrive at an expression for the final energy of the particle in a cyclotron.  
 b) The radius of cyclotron dee is 0.4m and the applied magnetic field is  $1.5 \text{ Wb/m}^2$ . What is the maximum energy of a beam of protons?  
 [Given mass of a *proton* =  $1.67 \times 10^{-27} \text{ kg}$ ]. (6+4)
  
9. a) Describe with diagram the working of a GM counter and explain its characteristics. Comment on the quenching action of a GM.tube.  
 b) In a LINAC protons are accelerated. The velocity of the proton in the first drift tube is  $4.7 \times 10^6 \text{ m s}^{-1}$  and the length of the drift tube is 1m. What would be the energy of the protons emerging out of the fourth drift tube? Also find the length of the fourth drift tube. [Given mass of *proton* =  $1.67 \times 10^{-27} \text{ kg}$ ]. (6+4)
  
10. a) What are fundamental particles? Explain the classification of fundamental particles with respect to mass, spin and interaction.  
 b) Calculate the average energy gained per revolution by electrons in a Betatron where they move in a orbit of radius 0.1m. Magnetic field strength at the orbit is 1.5T (Assuming electrons move with velocity of light), frequency of the oscillator is 50Hz. (6+4)

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CHE 601.2

Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**CHEMISTRY**

**PAPER VII: GENERAL CHEMISTRY**

Duration: 3 hours

Max Marks: 80

- Note: 1. Write question numbers and subdivisions clearly.  
2. Write chemical equations and diagrams wherever necessary.

**PART A**

1. Answer any **TEN** of the following:

10x2=20

- What are mononuclear carbonyls? Give an example.
- Calculate the number of microstates for  $d^2$  system.
- Write the IUPAC names of  
(i)  $C_6H_5MgBr$  (ii)  $Cr(C_6H_5)_2$
- What are inert complexes? Give an example.
- KCl is employed in the preparation of salt bridge. Why?
- Give two applications of hydrogen over voltage.
- State Grothus – Draper Law.
- What are photovoltaic cells?
- How do you convert pyridine into piperidine?
- How will you distinguish between the following pair using their IR spectrum?  
 $CH_3COOH$  &  $CH_3COCH_3$
- Define the term chemical shift in NMR Spectroscopy
- Give the IUPAC names of  
i) Thiophene (ii) Pyrrole

**PART-B  
UNIT-I**

Answer any **TWO** of the following.

2x10=20

- Explain how magnetic susceptibility is determined by Guoy's method. 04
  - Give any three applications of organo aluminium compounds. 03
  - Give any three differences between crystal field theory and valence bond theory. 03
- Derive the relationship between stepwise stability constant and overall stability constant for a complex. 04
  - Explain any two methods for the preparation of organo mercury compounds. 03
  - Write a note on spectrochemical series. 03
- Explain the structure and bonding in alkyl lithium compounds. 04
  - Give the selection rule on electronic transitions in transition metal complexes. 03
  - Explain any two applications of complexes in gravimetric analysis. 03



## UNIT-II

Answer any **TWO** of the following.

10x2=20

5. a) How is  $pH$  of a solution determined by EMF measurement using quinhydrone electrode? . 04
- b) Explain photosensitization with suitable example. 03
- c) Explain the construction and working of a nuclear power reactor. 03
6. a) Explain the construction and working of a hydrogen-oxygen fuel cell. 04
- b) A certain system absorbs  $3 \times 10^{18}$  quanta of light per second on irradiation for 30 minutes,  $3 \times 10^{-3}$  moles of the reactant reacted. Calculate the quantum yield. 03
- c) Explain the determination strength  $Fe^{+2}$  ions in solution by potentiometric method. 03
7. a) Describe the principle and experimental procedure adopted in the determination of solubility of sparingly soluble salt by E.M.F. method. 04
- b) Explain the photo chemical formation of HCl from  $H_2$  &  $Cl_2$ . 03
- c) Calculate the single electrode potential of copper electrode formed by dipping a copper rod in  $0.05M$   $CuSO_4$  solution at 298K ( $E_{Cu^{2+}/Cu}^0 = 0.34$  volt). 03

## UNIT-III

Answer any **TWO** of the following.

2x10=20

8. a) With the help of molecular orbital picture explain the aromatic character of pyrrole. 04
- b) Explain the NMR spectrum of ethyl alcohol. 03
- c) Explain the terms (i) molecular ion peak and (ii) meta stable peak? 03
9. a) Describe the mechanism of nitration of pyridine. 04
- b) What is the standard reference compound used in NMR to record the spectrum? What are its advantages? 03
- c) Explain the IR spectrum of benzaldehyde 03
10. a) Explain Woodward Fieser Rules for dienes? Give one example. 04
- b) How is quinoline obtained from Skraup's synthesis? 03
- c) Explain the mass spectrum of methane. 03

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CHE 602.2

Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**CHEMISTRY**

**ELECTIVE PAPER II: BIOLOGICAL CHEMISTRY**

Duration: 3 hours

Max Marks: 80

- Note: 1. Write question numbers and subdivisions clearly.  
2. Write chemical equations and diagrams wherever necessary.

**PART A**

1. Answer any **TEN** of the following:

10x2=20

- What are vitamins? How are they classified?
- Write the structure of Caffeine.
- What are antipyretics? Give an example.
- What are Terpenoids?
- Define prodrug.
- Define the term Potency.
- Write the structure of Paracetamol & Aspirin.
- What are Zwitter Ions?
- What is meant by Renaturation of Protein.
- What is Antagonist?
- Give the biological function of Selenium.
- What are Metalloporphyrins?

**PART-B  
UNIT-I**

Answer any **TWO** of the following.

2x10=20

- How are Terpenes isolated? 03
  - Explain Hofmann's exhaustive methylation method. 03
  - Elucidate the structure of Coniine. 04
- What happens when citral is heated with *aqueous*  $\cdot Na_2CO_3$ ? Give the equation. 05
    - Explain the synthesis of Guanine. 05
  - Elucidate the structure of menthol. 05
- What is isoprene rule. Explain with an example. 05
    - Show that citral is an  $\alpha, \beta$  unsaturated aldehyde. 05
  - Explain the constitution of Nicotine. 05

## UNIT-II

Answer any **TWO** of the following.

2x10=20

- |    |    |   |    |
|----|----|---|----|
| 5. | a) | What is meant by a receptor? Name any two.  | 03 |
|    | b) | Write a note on therapeutic index.  | 03 |
|    | c) | Explain the applications of Biosensors.   | 04 |
| 6. | a) | Explain the function of Tyrosine kinase linked receptors with the help of a figure. | 05 |
|    | b) | Explain briefly the various steps involved in Pharmacokinetics.                     | 05 |
| 7. | a) | i) What is competitive inhibition?  |    |
|    |    | ii) Explain the synthesis and uses of chloramine-T.                                 | 05 |
|    | b) | What is drug design? Explain the various steps involved in Drug Design.             | 05 |

## UNIT-III

Answer any **TWO** of the following.

2x10=20

- |     |    |   |    |
|-----|----|---|----|
| 8.  | a) | Explain the classification of protein based on the structure. | 05 |
|     | b) | Explain the structure and functions of chlorophyll.           | 05 |
| 9.  | a) | Give two methods of synthesis for amino acids.                | 05 |
|     | b) | Explain solid phase synthesis of a Dipeptide.                 | 05 |
| 10. | a) | Amino acids are amphoteric in nature. Why?                    | 03 |
|     | b) | Explain Gabriel's phthalimide synthesis of an amino acid.     | 03 |
|     | c) | Explain the synthesis of vitamin C.                           | 04 |

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## CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**CHEMISTRY****ELECTIVE PAPER I: ANALYTICAL AND INDUSTRIAL CHEMISTRY**

Duration: 3 hours

Max Marks: 80

- Note: 1. Write question numbers and subdivisions clearly.  
2. Write chemical equations and diagrams wherever necessary.

**PART A**1. Answer any **TEN** of the following: 10x2=20

- What is meant by peptisation?
- How many significant figures are there in:  
(i)  $1.490 \times 10^{-3}$  (ii) 0.0405
- Write two applications of flame photometry.
- What is a redox titration? Give an example.
- The Ellingham diagram of carbon using carbon dioxide is horizontal. Why?
- What is froth floatation process?
- What is slag? Give an example.
- How is Buna-S synthesized?
- What is 'Pasteurization'?
- What are food preservatives? Give an example.
- What are the raw materials required for the production of  
(a) Urea (b) Ammonium nitrate.
- What are the common industrial effluents?

**PART-B  
UNIT-I**Answer any **TWO** of the following. 2x10=20

- What is the difference between absolute and relative error? 03
  - What are the criteria for selection of an indicator for a titration? 03
  - Explain the technique used in DTA. 04
- Explain complexometric titrations with an example. 03
  - Write a note on gas-liquid chromatography. 03
  - An analyst analyzed the sample of Iron spectrophotometrically and obtained the following data for the concentration of Iron in pp: 18.7, 19.1, 19.0, 19.2, 19.3 19.4 and 18.8. Calculate mean deviation, standard deviation and coefficient of variance. 04
- Write a note determinate errors and how it can be minimized? 04
  - Explain Electrogravimetry. 03
  - Discuss the principle of Atomic absorption spectroscopy. 03



## UNIT-II

Answer any **TWO** of the following.

2x10=20

- |    |    |  |    |
|----|----|--|----|
| 5. | a) | Using redox potential data explain why oxygen is necessary in the cyanide process of extraction of silver. | 03 |
|    | b) | Explain desilverisation of lead by Parke's process.  | 04 |
|    | c) | Explain the synthesis of acrylonitrile from petrochemicals.  | 03 |
| 6. | a) | Explain analysis of redox cycle using cyclic voltametry.   | 03 |
|    | b) | Explain Baeyer's method for the purification of bauxite.   | 04 |
|    | c) | Explain the synthesis of vinyl chloride from petrochemicals.   | 03 |
| 7. | a) | What is Ellingham diagram? How it is useful in deducing the reducing agent in the metallurgy of iron.      | 04 |
|    | b) | Explain Bett's process for refining lead.  | 03 |
|    | c) | Explain the synthesis of formaldehyde from petrochemicals.   | 03 |

## UNIT-III

Answer any **TWO** of the following.

2x10=20

- |     |    |   |    |
|-----|----|---|----|
| 8.  | a) | Write a note on sweeteners.   | 03 |
|     | b) | What is BHC? How is it prepared?  | 03 |
|     | c) | What is soil pollution? How can it be minimized?  | 04 |
| 9.  | a) | Explain: (i) PFA Act<br>(ii) AGMARK Standard<br>(iii) ISI Standard  | 03 |
|     | b) | Explain the preparation of superphosphate of lime.  | 03 |
|     | c) | Explain primary process of sewage water treatment.  | 04 |
| 10. | a) | Name the adulterant present in<br>(i) honey (ii) turmeric (iii) Bengal gram flour. How are they detected? | 03 |
|     | b) | What is parathion? How is it prepared?  | 03 |
|     | c) | What is BOD? Explain the method of determination of BOD.  | 04 |

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## CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**COMPUTER SCIENCE****PAPER VII – ASP.NET**

Time: 3 Hrs

Max. Marks: 80

**PART – A**

1. Answer any TEN questions from the following:

2x10=20

- a) What is the purpose of Web Control?
- b) Write any two features of visual Web developer (VWD)
- c) Mention any four properties of Base Validator Class.
- d) List the different templates supported by login view control.
- e) Define Event-Driven Programming model.
- f) List the Navigation controls in ASP.NET.
- g) Mention the advantages of web parts.
- h) What is the use of hyperlink control?
- i) Give an example for Range Validator control.
- j) What is the use of Password Recovery control?
- k) List any two methods of Grid View control.
- l) What is the role of WebPartManger control?

**PART – B**

Answer any TWO questions from each unit.

**UNIT – I**

2. a) Explain any four advantages of ASP.NET. (4)  
b) What is provider model in ASP.NET and explain any two provider types. (6)
3. a) List the types of Button controls and explain any five common properties. (6)  
b) What is ListItemCollection and explain any four methods. (4)
4. a) Explain in detail the methods of global asax file corresponding to the events that are not involved with each user request. (6)  
b) Write the syntax of image control and explain its three properties. (4)

**UNIT – II**

5. a) Write a note on Calendar Control. (6)  
b) Explain the properties of compare validator control. (4)
6. a) Explain different templates involved in customizing the appearance of SiteMap control. (6)  
b) Explain any two events of AdRotator class. (4)
7. a) Explain the different controls present under the login control tab. (7)  
b) Explain TreeView in ASP.NET. with an example. (3)

**UNIT – III**

8. a) Explain any 5 properties of Gried View control. (5)  
b) Write a note on Data Adapter. (5)
9. a) Explain any two Data Source control in detail. (6)  
b) What are the different templates offered by Data list? (4)
10. a) Explain in brief the controls that are useful in implementing web parts. (6)  
b) Explain run-time behavior of Master pages? (4)

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## CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION

**COMPUTER SCIENCE**PAPER VIII – MICROPROCESSOR ARCHITECTURE AND 8086 PROGRAMMING  
Time: 3 Hrs

Max. Marks: 80

## PART – A

1. Answer any TEN questions from the following:

2x10=20

- a) What is an instruction code?
- b) Differentiate between the instructions BUN and BSA.
- c) What is a stack?
- d) What is reverse polish notation?
- e) Expand i) RISC ii) CISC
- f) What is zero-address instruction?
- g) Identify the addressing mode of the following.  
i) ~~M~~OV AX, [BX+10H] ii) MoV AX, [BX+SI+20H]
- h) List the segment registers.
- i) What is meant by assembler directives?
- j) Name the general purpose registers.
- k) Differentiate between PUSHA and PUSHF instructions.
- l) What is the purpose of CALL and RET instructions?

## PART – B

Answer any <sup>all</sup> TWO questions from each unit.

## UNIT – I

2. a) Explain the general register organization. (6)  
b) With examples, explain any two addressing modes. (4)
3. a) Explain 64- ward stack register with a block diagram. (6)  
b) Write a note on instruction Cycle. (4)
4. a) With a neat diagram, explain control unit of basic computer. (6)  
b) Explain i) Two-address instruction  
ii) One-address instruction (4)

## UNIT – II

5. Explain 8086 internal architecture with a block diagram. (10)
6. Explain 8086 flag register with its neat format. Also write the status of carry flag after subtracting ABCD<sub>(H)</sub> from 5678<sub>(H)</sub> (10)
7. a) Explain pointer and index registers. (5)  
b) Write a note on data definition and storage allocation directives. (5)

## UNIT – III

8. a) Explain the instruction i) LEA ii) LDS iii) LAHF (6)  
b) With examples, explain SHR and SAL instructions. (4)
9. a) Explain any three logical instructions with examples. (6)  
b) Explain LOOP instruction with an example. (4)
10. a) Write a note on exception interrupts. (6)  
b) Explain the instructions i) STOSB ii) CMPSW (4)

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STA 601

Reg. No. ....

**CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018**

**STATISTICS**

**PAPER- VII ANOVA & DESIGN OF EXPERIMENTS**

**Time: 3 Hrs**

**Max. Marks: 80**

**PART - A**

**Answer any TEN of the following:**

**10X2=20**

1. a) Define experiment and uniformity trials.
- b) Define analysis of variance.
- c) State general assumptions made in analysis of variance.
- d) Give the model for two-way classified data and explain its components.
- e) Give one example for CRD.
- f) Distinguish between conjugate and self conjugate LSD.
- g) Write any two advantages of L.S.D.
- h) Give expressions for estimating two missing values in an RBD.
- i) Explain 'factors' and 'levels' in a factorial experiment.
- j) Write any two advantages of factorial experiment.
- k) Define contrast and orthogonal contrast.
- l) Distinguish between complete and partial confounding.

**PART - B**

**Answer any TWO of the following:**

**10x2=20**

2. a) Explain three basic principles of Designs of experiment. (6)
- b) Find least square estimates of the parameters of one way classified data. (4)
3. Explain the technique of ANOVA for two way classification starting breakdown of the total sum of squares, their distribution and the hypothesis that are usually tested. Also write down the ANOVA table. (10)
4. a) Describe the technique of ANOVA for three way classification stating the breakdown of total sum of squares. (5)
- b) Obtain expected value of sum of squares due to error under three way classified data. (5)



**Answer any TWO of the following:**

**2x10=20**

5. a) Briefly discuss the layout under CRD. (4)  
 b) Derive an expression for the efficiency of LSD over RBD by considering columns as blocks. (6)
6. a) Explain the procedure of testing any two treatment effects in an R.B.D. (4)  
 b) Derive an expression for estimating two missing observation in an L.S.D by the method of least squares. (6)
7. a) Derive an expression for estimating one missing observation in an R.B.D by the method of least squares. (5)  
 b) Find expectation of treatment sum of square in an LSD (5)

**Answer any TWO of the following:**

**2x10=20**

8. Give statistical analysis of  $2^2$  factorial experiment carried out in an R.B.D. (10)
9. Explain Yate's method of computing factorial effect totals in  $2^3$  factorial experiments. Also show that main and interaction effects are orthogonal to each other. (10)
10. a) What are the advantages and disadvantages of confounding? (3)  
 b) Explain how the statistical analysis can be carried out in case of partial confounding in  $2^3$  factorial experiment. (7)

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STA 602.2

Reg. No. ....

CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018

**STATISTICS – VIII**  
**STATISTICAL QUALITY CONTROL**

Time: 3 Hrs

Max. Marks: 80

**PART - A**

Answer any TEN of the following:

10X2=20

1. a) Distinguish between quality as an attribute and as a variable.  
b) When the process is said to be under statistical control.  
c) How does the product control achieved in SQC?  
d) What are modified control limits?  
e) Define fraction defective.  
f) What is AOQL?  
g) Define consumer's risk.  
h) What is ASN?  
i) Write down the AOQ for SSP by attributes.  
j) Write down the control limits for number of defectives chart.  
k) What do you mean by acceptance sampling?  
l) An item has an exponential distribution with failure rate of 6% per 1000 hrs. Find the reliability of the item at 5000 hrs. Find MTTF.

**PART - B**

Answer any TWO of the following:

2x10=20

2. a) What are the objectives of SQC?  
b) Explain action limits and warning limits. (5+5)
3. a) Explain process control and product control.  
b) Write a note on rational subgroups. (5+5)
4. a) Mention the criterion of lack of control with respect to control chart for variables.  
b) Distinguish between chance variation and assignable variation in qualities. (5+5)

Answer any TWO of the following:

2x10=20

5. a) Compare the control charts for attributes and variables.  
b) Obtain the control limits for  $\bar{X}$  and R charts when standards are given. (5+5)

6. a) Explain the theoretical basis for fraction defective control chart.  
b) Derive the control limits for the  $u$ -chart stating the assumptions (5+5)
7. a) What is defect? Write down any four situations where C-chart is applicable.  
b) Explain the method of constructing p-chart when sample size is varying. (5+5)

**Answer any TWO of the following:**

**10x2=20**

8. a) Derive an expression for AOQ in SSP by attributes.  
b) Derive OC function in SSP by attributes. (5+5)
9. a) Derive SSP by variables when lower specification limit  $L$  is given &  $\sigma$  is unknown.  
b) Mention the merits and demerits of variable sampling plan. (5+5)
10. a) Briefly discuss system reliability and system maintainability.  
b) Derive an expression for the reliability of the system when the components are connected in series and in parallel. (5+5)

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**CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018**  
**ZOOLOGY**

**Paper VII: Genetics, Evolution & Palaeontology**

Duration: 3 Hrs.

Max. Marks: 80

Note: i) Answer any TEN questions from Part A  
 ii) Answer SIX questions from Part B choosing any TWO questions from each unit.

**PART – A**

**I. Answer any TEN of the following:**

10×2=20

- a) Define norm of reaction. Give an example.
- b) State the law of independent assortment.
- c) What is polygenic inheritance? Give an example.
- d) What are gynandromorphs? Give an example.
- e) Name 4 types of comb pattern found in fowls.
- f) What are sex influenced traits? Give two examples.
- g) Name the structural genes in the lac operon.
- h) Write any two characteristics of Down's Syndrome.
- i) What are vestigial organs? Give an example
- j) Differentiate homologous organs from analogous organs.
- k) What is macroevolution?
- l) Write any 2 characters of Eohippus.

**PART – B**  
**UNIT – I**

- II. a) What is dominant epistasis? Explain it with reference to coat colour in Dogs. 07
- b) Write a note on phenocopy. 03
- III. a) Give an account on blood typing and blood transfusion. Add a note on blood group genetics. 07
- b) Write the significance of linkage. 03
- IV. a) What is a monohybrid cross? Explain with an example of Drosophila. 05
- b) Explain incomplete linkage in Drosophila. 05

**UNIT – II**

- V. a) Give an account on chromosomal types of sex determination. 07
- b) Describe briefly chorionic villi sampling technique. 03
- VI. a) Write explanatory note on i) Phenylketonurea ii) Huntington's chorea 07
- b) What is haemophilia? What are its characteristics? 03

- VII. a) In *Drosophila*, white eye colour is recessive to normal red eye colour and is a sex linked trait. In a cross, a red eyed male was crossed with a white eyed female. Show the  $F_1$  and  $F_2$  progenies. 05
- b) Write a short note on chemical mutagens. 05

### UNIT – III

- VIII. a) What is Darwinism? Explain the postulates of Darwinism with a suitable examples. 07
- b) Explain Hardy-weinberg Law. 03
- IX. a) Give an account on evidences of organic evolution from comparative physiology and biochemistry. 07
- b) Write a brief note on stegosaurus. 03
- X. a) Explain briefly allopatric speciation. 05
- b) 'Archaeopteryx is a connect link between reptiles and birds'. Justify. 05

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**CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018  
ZOOLOGY**

**Paper VIII: Environmental Biology, Toxicology and Biostatistics**

Duration: 3 Hrs.

Max. Marks: 80

Note: i) Answer any TEN questions from Part A  
ii) Answer SIX questions from Part B choosing any TWO questions from each unit.

**PART – A**

**I. Answer any TEN of the following:**

10×2=20

- 1) Define the term Ecology.
- 2) Define cyclomorphosis.
- 3) Define commensalism. Give an example.
- 4) What are Mangroves? Write any two features of mangrove vegetation.
- 5) Name any two methods to measure the Population Density
- 6) Define ecological niche with a example.
- 7) State the "Leibigs law of Minimum".
- 8) Name any two nitrogen fixing organisms.
- 9) Define Frequency.
- 10) What are zootoxins? Give an example.
- 11) What is Smog?
- 12) What is the scope of Biostatistics?

**PART – B  
UNIT – I**

- II.** a) Explain the process of Pedogenesis. 07  
b) Write short note on Tundra biome. 03
- III.** a) What are food chains? Explain the various types of food chains with help of schematic representations. 07  
b) Explain the zonation of the lentic habitat. 03
- IV.** a) Define Abiotic factors. Explain the effect of light on locomotion and metabolism of animals. 05  
b) Explain the term parasitism. Discuss the different forms of parasites. 05

**UNIT – II**

- V.** a) What are Biogeochemical cycles ?. Explain carbon cycle with illustration. 07  
b) Write short notes on Natality. 03



- VI. a) What are ecological successions? Explain the kinds of successions and process of succession. 07  
b) What is Red Data Book? Explain. 03
- VII. a) Write explanatory notes on Ecotone and Edge effect. 05  
b) With reference to population. Explain growth curve. Add a note on Gause's Principle. 05

### UNIT – III

- VIII. a) Explain the different methods of collecting primary data. 07  
b) Explain the various sources of Toxicity. 03
- IX. a) With reference to Pollution explain entrophication. 07  
b) Calculate Mean and Median for the given ungrouped data 10, 8, 20, 22, 39, 18 03
- X. a) What are Pesticides? Discuss the effects of DDT. 05  
b) Discuss the effects of Radioactive Compounds and their toxicity. 05

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**CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018  
MICROBIOLOGY****Paper VII: Food, Dairy and Industrial Microbiology****Duration: 3 Hrs.****Max. Marks: 80****Note: Draw diagrams wherever necessary.****PART – A****I. Answer any TEN of the following:****2×10=20**

- a) Bacterial Rot in Fruits
- b) Souring
- c) CSL
- d) Radiations in Preservation
- e) HTST
- f) Impeller
- g) Dehydration of Food
- h) Lipolytic Activity
- i) White Wine
- j) Idli
- k) MBRT
- l) Brewing

**PART – B****Answer any two complete questions from each unit.****UNIT – I****(10×2=20)**

- II. a) Explain preservation of food by high temperature. (06)  
b) Differentiate between Intoxication and Infection. (04)
- III. a) Explain the factors responsible for spoilage of food. (06)  
b) Write in brief on ensilage. (04)
- IV. a) Explain the different standards for food quality control. (06)  
b) Write a short note on contamination of poultry. (04)

**UNIT – II****(10×2=20)**

- V. a) Explain sterilization of milk. (06)  
b) Write a note on Resazurin Reduction Test. (04)
- VI. a) Explain the sources of microbial contamination of milk. (06)  
b) Write a short note on fermented dairy product with reference to Acidophilus Milk. (04)
- VII. a) Discuss about the Milk Microflora. (06)  
b) Explain Ropy Milk. Add a note on Pigment Production in Milk. (04)

**UNIT – III****(10×2=20)**

- VIII. a) Explain continuous sterilization method used for Fermentor. (06)  
b) Write a short note on Vinegar. (04)
- IX. a) Explain the industrial production of Penicillin. (06)  
b) Draw a neat labelled diagram of a Fermentor. (04)
- X. a) Explain the different types of media used in Fermentation. (06)  
b) Write a note on culture collection center. (04)

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**CREDIT BASED SIXTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL 2018**  
**MICROBIOLOGY****Paper VIII: Bacterial Genetics****Duration: 3 Hrs.****Max. Marks: 80****Note: Draw diagrams wherever necessary.****PART – A****I. Answer any TEN of the following:****2×10=20**

- a) Plasmids
- b) Nucleotides
- c) Cloning
- d) DNA Repair
- e) Transduction
- f) Translocation
- g) Transgenic Plants
- h) Microlesion
- i) Nif Genes
- j) rRNA
- k) Intragenic Mutation
- l) Gyases

**PART – B**  
**UNIT – I****Answer any two complete questions of the following:****2×10=20**

- II. a) Explain the enzymes involved in DNA Replication. (06)
- b) Write a note on tRNA. (04)
- III. a) Explain the process of conjugation in prokaryotes. (06)
- b) Write a note on Transcription. (04)
- IV. a) Explain the Lac Operon Concept. (06)
- b) Write a note on Genetic Code. (04)

**UNIT – II****Answer any two complete questions of the following:****2×10=20**

- V. a) Explain the mutation types based on the genotypic changes causing Macrolesions. (06)
- b) Write a note on mutation caused by UV rays. (04)
- VI. a) Explain the isolation of Biochemical Mutants by Replica Plating Technique. (06)
- b) Write a note on Mutation Rate. (04)
- VII. a) Explain the Base pair substitution types of mutation. (06)
- b) Write a note on Base Analogues. (04)

**UNIT – III****Answer any two complete questions of the following:****2×10=20**

- VIII. a) Explain the hybridization method for DNA isolation. (06)
- b) Write a note on the principles of Genetic Engineering. (04)
- IX. a) Explain splicing and insertion of DNA. (06)
- b) Explain the types and uses of restriction enzymes. (04)
- X. a) Explain the potential hazards and safeguards of Genetic Engineering. (06)
- b) Write a note on Antirabies Vaccine. (04)

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