

**Jain Engineering Entrance Test (JEET – 2012)****Model Question Paper & Syllabus****Total Marks: 50****Duration: 01 Hour****No Negative Marks**

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**Paper I - Chemistry****I. SYLLABUS****SECTION -1 –INORGANIC CHEMISTRY**

CHAPTER 1: METALLURGY -2

CHAPTER2: INDUSTRIALLY IMPORTANT COMPOUNDS

CHAPTER3: GROUP 18, NOBLE GASES

CHAPTER4: D-BLOCK ELEMENTS

CHAPTER5: COORDINATION COMPOUNDS

CHAPTER6: CHEMICAL BONDING-2

**SECTION -2- PHYSICAL CHEMISTRY**

CHAPTER 7: CHEMICAL KINETICS

CHAPTER8: ELECTROCHEMISTRY

CHAPTER9: THEORY OF DILUTE SOLUTIONS

CHAPTER10: CHEMICAL THERMODYNAMICS-2

CHAPTER11: COLLOIDS

CHAPTER12: SOLIDS

**SECTION-3 –ORGANIC CHEMISTRY**

CHAPTER13: CONCEPTS IN ORGANIC CHEMISTRY

CHAPTER14: SYNTHETIC ORGANIC CHEMISTRY

CHAPTER15: ISOMERISM-2

CHAPTER16: HYDROCARBONS-2

CHAPTER17: HALOALKANES

CHAPTER18: ORGANIC COMPOUNDS CONTAINING OXYGEN-2

CHAPTER19: AMINES

CHAPTER20: CARBOHYDRATES

CHAPTER21: OILS AND FATS

CHAPTER22: AMINO ACIDS AND PROTEINS

**SECTION-4-PRACTICALS AND MODEL QUESTIONS PAPERS**

## II. MODEL QUESTION PAPER

- Which is true regarding dissociation energies of  $N_2$  and  $N_2^+$ ?  
a) Equal for both    b) lesser for  $N_2$     c) Greater for  $N_2$     d) Cannot be predicted
- Which is the major product formed when hydrogen iodide is added to propene in the presence of hydrogen peroxide?  
a) 1-Iodopropane  
b) 2-iodopropane  
c) 1,1-diiodopropane  
d) a & b are formed in equal proportions.
- What is the magnetic moment of  $V^{3+}$  ( $Z=23$ )?  
a) 1.73BM    b) 2.84BM    c) Zero    d) 3.26BM
- Which of the following is not formed when a mixture of ethyl iodide & propyl iodide undergoes Wurtz reaction?  
a) Propane    b) Butane    c) Pentane    d) Hexane
- 50 litres of 0.1M HCl are mixed with 50litres of 0.2M NaOH .The  $P^{OH}$  of the resulting solution is .....  
a) 12.70    b) 12.34    c) 8.7    d) 4.2
- Which of the following compounds undergoes aldol condensation?  
a) 2,2-dimethyl Propanal    b) Diphenyl ketone  
c) Butanal    d) Benzaldehyde
- The equilibrium constant for a reaction is 10.  $\Delta G^\circ$  will be .....(  $R=8 \text{ JK}^{-1}\text{mol}^{-1}$  &  $T =300\text{K}$ )  
a)  $-5527\text{kJmol}^{-1}$     b)  $-5.527\text{kJmol}^{-1}$     c)  $-55.27\text{kJmol}^{-1}$     d)  $+5.527\text{kJmol}^{-1}$
- What is true about benzene?  
a) It undergoes electrophilic addition readily.  
b) All the carbon atoms are  $sp^3$ -hybridized.  
c) Each carbon has an unhybridized p-orbital.

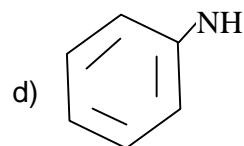
d) The molecule is non-planar.

9. Select the least basic compound from the following?

a)  $\text{NH}_3$

b)  $\text{CH}_3\text{-NH}_2$

c)  $\text{CH}_3\text{-NH-CH}_3$



10. A reaction that is of first order with respect to reactant A has rate constant  $6 \text{ min}^{-1}$ . If we start with  $[\text{A}] = 0.5 \text{ molL}^{-1}$ . When would  $[\text{A}]$  reach the value of  $0.05 \text{ molL}^{-1}$ ?

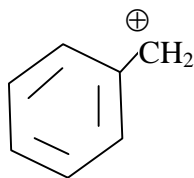
a) 0.384min

b) 0.15min

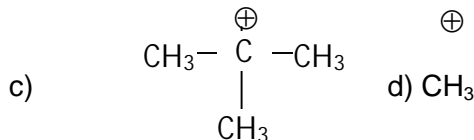
c) 3.0min

d) 3.84min

11. Which carbocation is most stable?

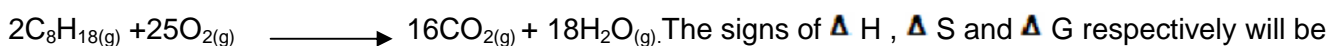


b)  $\text{CH}_3\text{-CH-CH}_3^{\oplus}$



d)  $\text{CH}_3^{\oplus}$

12. Consider the following reaction in an automobile :



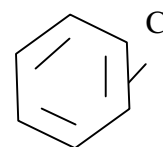
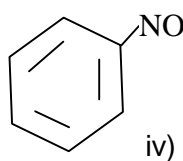
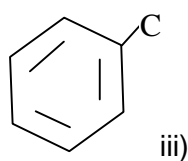
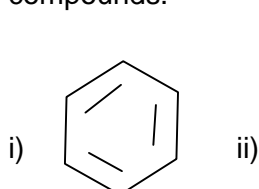
a) +Ve, +Ve, +Ve

b) -Ve, +Ve, -Ve

c) -Ve, +Ve, +Ve

d) +Ve, -Ve, +Ve

13. Select the correct decreasing order of reactivity towards electrophilic substitution for the following compounds.



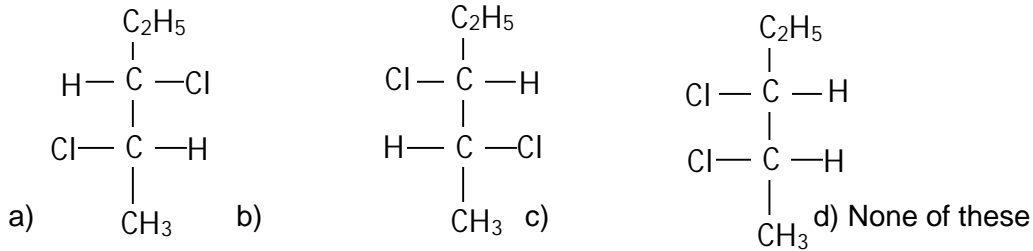
a)  $\text{IV} > \text{I} > \text{II} > \text{III}$

b)  $\text{IV} > \text{II} > \text{I} > \text{III}$

c)  $\text{IV} > \text{I} > \text{III} > \text{II}$

d)  $\text{IV} > \text{III} > \text{II} > \text{I}$

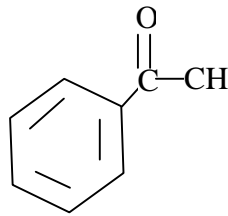
14. Which of the following has a plane of symmetry?



15. Select a true statement

- a) Maleic acid is more stable than fumaric acid.
- b) Cis-2-butene has higher melting point than trans-2-butene.
- c) Cis-2-butene has higher boiling point than trans-2-butene.
- d) Dipole moment of Cis-isomers is zero.

16. What is the IUPAC name of



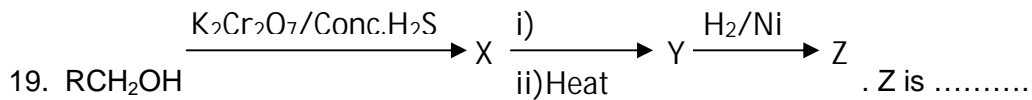
- a) Acetophenone
- b) Methyl ketobenzene
- c) 1-Phenyl ethanone
- d) Phenyl methyl ketone

17. Which of the following is not a colligative property?

- a) Depression in freezing point
- b) Elevation in boiling point
- c) Osmotic pressure
- d) Lowering in vapor pressure

18. Reagent used in Hoffmann-Bromamide reaction is.....

- a) NaOH+CaO                      b) NaOH+Br<sub>2</sub>                      c) K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>                      d) HNO<sub>2</sub>



- a) RCH<sub>2</sub>CH<sub>2</sub>NH<sub>2</sub>                      b) RCH<sub>2</sub>NH<sub>2</sub>                      c) RCH<sub>2</sub>CONH<sub>2</sub>                      d) RNH<sub>2</sub>

20. Which of the following species has /have fractional bond order?

- a) H<sub>2</sub><sup>+</sup>                                      b) O<sub>2</sub><sup>+</sup>                                      c) N<sub>2</sub><sup>+</sup>                                      d) All

21. Half –life period of a reaction is found to be inversely proportional to the cube of the initial concentration .The order of reaction is .....

- a) 4    b) 3    c) 5    d) 2

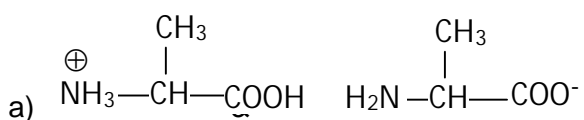
22. Chiral carbon atoms in glucose and fructose are .....

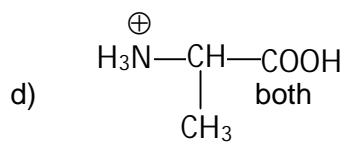
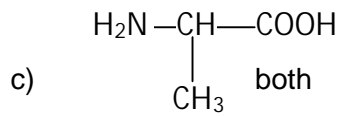
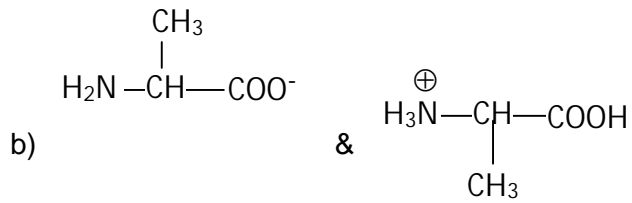
- a) 3 in each    b) 4 in each  
c) 3 in glucose, 4 in fructose    d) 4 in glucose, 3 in fructose

23. Hydrolytic reaction of fats with caustic soda is known as :

- a) Carboxylation    b) Acetylation    c) Saponification                      d) Esterification

24. Structures of alanine at P<sup>H</sup> = 2 and P<sup>H</sup> = 10 are respectively.....





25. 0.025g of starch was required to prevent the coagulation of 10mL of gold sol when 1mL of 10% NaCl solution is added. What is the gold number of starch?

- a) 0.025                      b) 0.25                      c) 2.5                      d) 25

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**Paper I - Physics**

**III. SYLLABUS**

**UNIT-1 – GEOMETRICAL OPTICS**

1. REFRACTION AT A PLANE SURFACE
2. REFRACTION THROUGH A PRISM
3. REFRACTION AT A SPHERICAL SURFACE

**UNIT-2-PHYSICAL OPTICS**

4. INTRODUCTION TO THEORIES OF LIGHT
5. INTERFERENCE OF LIGHT
6. DIFFRACTION OF LIGHT
7. POLARISATION OF LIGHT
8. SPEED OF LIGHT

**UNIT-3-ELECTROSTATICS**

9. ELECTRIC CHARGES
10. ELECTROSTATIC FIELD
11. CAPACITORS

**UNITS-4-CURRENT ELECTRICITY**

12. ELECTRIC CURRENT
13. KIRCHHOFF'S LAW
14. MAGNETIC EFFECT OF ELECTRIC CURRENT
15. MECHANICAL EFFECT OF ELECTRIC CURRENT
16. ELECTROMAGNETIC INDUCTION

**UNITS-5-ATOMIC PHYSICS**

17. INTRODUCTION TO ATOMIC PHYSICS
18. PHOTOELECTRIC EFFECT
19. DUAL NATURE OF MATTER
20. BOHR'S ATOM MODEL
21. SCATTERING OF LIGHT
22. LASERS
23. NUCLEAR PHYSICS
24. RADIOACTIVITY
25. ELEMENTARY PARTICLES
26. SOLID STATE ELECTRONICS
27. DIGITAL ELECTRONICS
28. SOFT CONDENSED MATTER PHYSICS



### IV. MODEL QUESTION PAPER

1. Liquid is filled in a vessel of height  $\frac{2H}{3}$ . At the bottom of vessel there is a spot 'P' and a hole from which liquid is coming out. Let 'd' be the distance of image of P from an eye at a height H from bottom at an instant when level of liquid in the vessel is x. If we plot a graph between d and x it will be take

Ans: c)

2. In a young's double slit experiment, 12 fringes are observed to be formed in a certain segment of the screen when light of wavelength 600nm is used. If the wavelength of light is changed to 400nm, number of fringes observed in the same segment of the screen is given by

Ans : b) 18

3. A parallel beam of monochromatic light of wavelength  $\lambda$  is incident normally on a diffraction grating G. The angle between the direction of the two second order diffracted beams at  $P_1$  and  $P_2$  is  $\alpha$  as shown in diagram. What is the spacing of the lines on the grating?

**2** **EMBED Equation. DSMT4** **3** **3**

Ans: d)  $\frac{2\lambda}{\sin(\alpha/2)}$

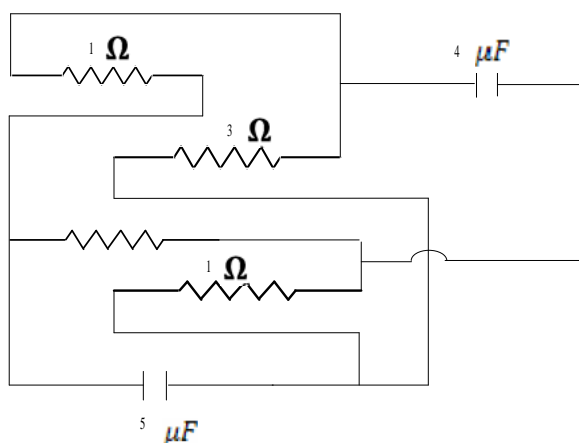
4. A cubic container is filled with a liquid whose refractive index increases linearly from top to bottom. Which of the following represents the path of a ray of light inside the liquid?

Ans: a)

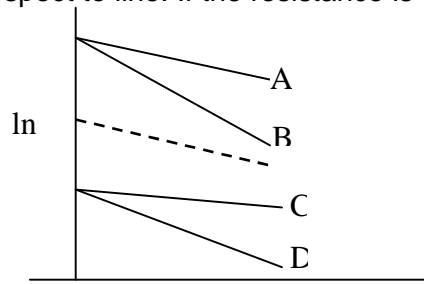
5. The equivalent resistance across AB in the given network is

Ans: b)  $3 \Omega$

6. Calculate the charge on the capacitor long time after the assembling of the circuit

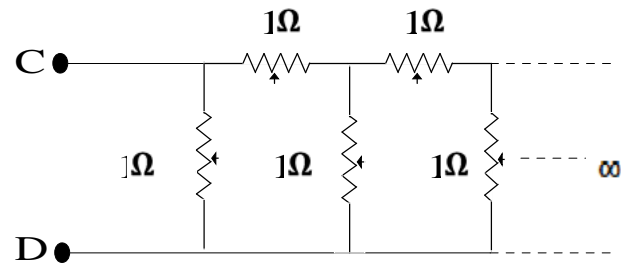
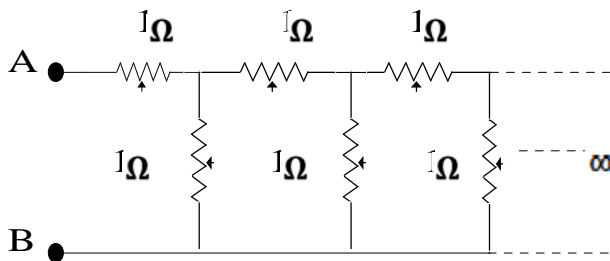


7. A capacitor is charged using an external battery with a resistance  $x$  in series. The dashed line shows the variation of  $\ln i$  with respect to time. If the resistance is changed to  $2x$ , the graph will be: [ $i$  = current]



- a) A                      b) B                      c) C                      d) D

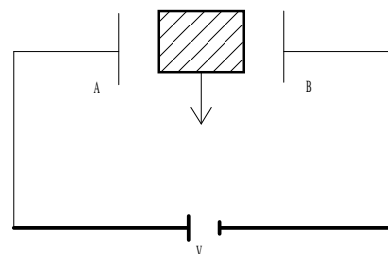
8. In the two circuits shown in figure



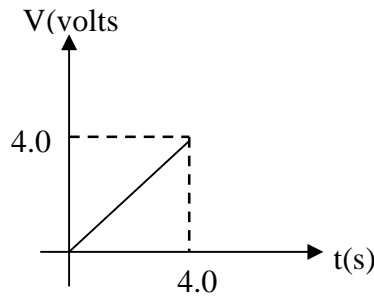
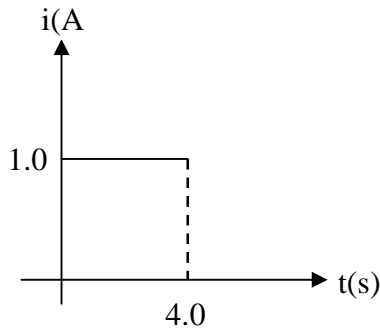
- a)  $R_{AB} = R_{CD} = (\sqrt{3} + 2) \Omega$                       b)  $R_{AB} = (\sqrt{3} + 1) \Omega$   
 c)  $R_{CD} = (\sqrt{5} + 1) \Omega$                                       d)  $R_{AB} > R_{CD}$

9. An insulator plate is passed between the plates of a capacitor. Then current in the outer circuit

- a) Always flows from A to B  
 b) Always flows from B to A  
 c) First flows from A to B and then from B to A  
 d) First flows from B to A and then from A to B

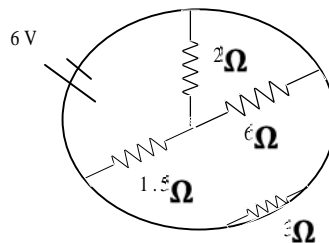


10. Current versus time and voltage versus time graph of a circuit element is shown below :



- a) Capacitance of 2F  
 b) Resistance of  $2\ \Omega$   
 c) Capacitance of 1F  
 d) A voltage source of emf 1V

11. The total current supplied to the circuit by the battery in the given circuit is :



- a) 1A  
 b) 2A  
 c) 4A  
 d) 6A

12. Four charges equal to Q are placed at the four corners of a square and a charge Q is at its centre. If the system is in equilibrium q = \_\_\_\_\_

- a)  $-\frac{Q}{4} (1+2\sqrt{2})$   
 b)  $\frac{Q}{4} (1+2\sqrt{2})$   
 c)  $-\frac{Q}{2} (1+2\sqrt{2})$   
 d)  $\frac{Q}{2} (1+2\sqrt{2})$

13. An  $\alpha$  - particle accelerated through V volt is fired towards a nucleus. Its distance of closest approach is r. If a proton accelerated through the same potential is fired towards the same nucleus, The distance of closet approach of the proton will be:

- a) r  
 b) 2r  
 c) r/2  
 d) r/14

14. A transistor has  $\alpha = 0.95$  then  $\beta$  is :

- a) 0.95  
 b) 1.5  
 c) 19  
 d)  $\frac{1}{19}$

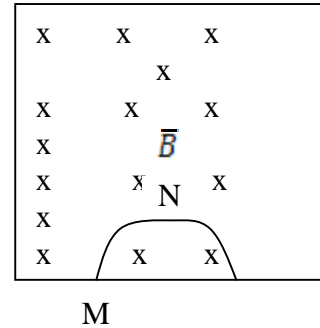
15. Which of the following can act as the building blocks for the other gates?

- a) NAND and NOR  
 b) NAND and AND  
 c) XOR and OR  
 d) NOT and OR

16. The equation  ${}_Z X^A \rightarrow {}_{Z+1} Y^A + {}_{-1} e^0 + \bar{\nu}$  represents

- a)  $\beta^-$  - decay  
 b)  $\delta$  decay  
 c) fusion  
 d) fission

17. Which electronic transition in  $\text{Li}^{2+}$  ion would emit radiation of same wavelength as the wavelength of second Balmer line of H – atom?  
 a) 12 9                                      b) 12 6                                      c) 4 3                                      d) 6 3
18. A thin semi circular conduction ring of radius R is falling with its plane vertical in a horizontal magnetic field  $\vec{B}$ . At the position MNQ the speed of the ring is V and the potential difference developed across the ring is



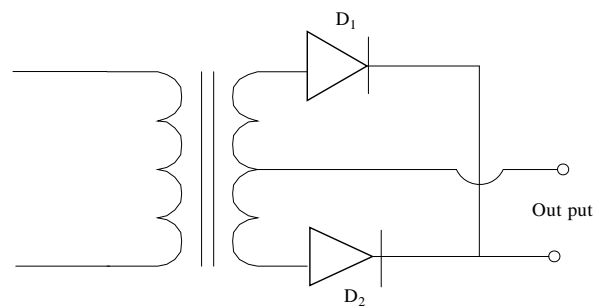
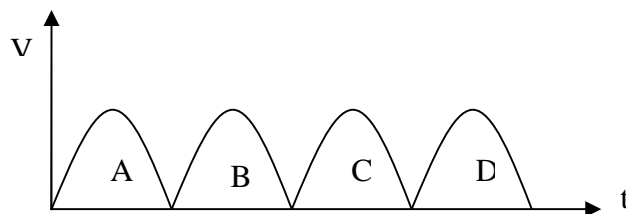
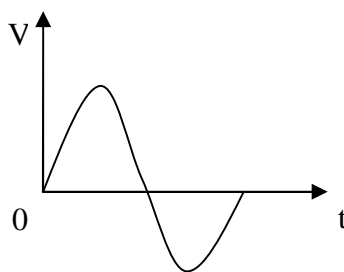
- a) Zero  
 b)  $B V \sqrt{R^2/2}$  and M is at higher potential  
 c)  $\sqrt{2} B R V$  and Q is at higher potential  
 d)  $2 R B V$  and Q is at higher potential

19. A charge Q moves with a velocity  $2 \text{ MS}^{-1}$  along X axis in a uniform magnetic field

$$\vec{B} = (\hat{i} + 2\hat{j} + 3\hat{k}) \text{ tesla}$$

- a) Charge will experience a force in Z-Y plane  
 b) Charge will experience a force along  $-Y$  axis  
 c) Charge will experience a force along  $+Z$  axis  
 d) Charge will experience a force along  $-Z$  axis

20. A full wave rectifier circuit along with the output is shown in figure. The contribution from diode  $D_1$  from diode  $D_1$  can be



- a) A,B                                      b) B,C                                      c) A,C                                      d) A, B, C, D

21. It is proposed to use the nuclear fusion reaction  ${}^1_1\text{H} + {}^2_1\text{H} \rightarrow {}^3_2\text{He}$  in a nuclear reactor of 200 MW rating. If the energy from the above reaction is used with 25% efficiency of the reactor, how many gram

of deuterium fuel will be needed per day  $m({}^2_1\text{H}) = 2.0141u$  &  $m({}^4_2\text{He}) = 4.0026u$

- a) 300g                                      b) 121g                                      c) 248g                                      d) 443g

22. Monochromatic light of wavelength 310nm is falling on an isolated metallic sphere of radius 1.8cm. Find the number of photo electrons ejected before the emission of photoelectrons is stopped. The work function of the metal is 2ev.

- a)  $2.5 \times 10^7$                                       b)  $5 \times 10^7$                                       c)  $3.5 \times 10^7$                                       d)  $4.5 \times 10^7$

23. The dimensional formula for Planck's constant is

- a)  $ML^2 T^{-1}$                                       b)  $ML^2 T^{-2}$                                       c)  $MLT^{-2}$                                       d)  $ML^{-2} T^1$

24. De-Broglie wave length associated with a He atom in helium gas at a temperature of 27°C and pressure 1 atm is

- a)  $7.3\text{Å}$                                       b)  $73\text{Å}$                                       c)  $0.73\text{Å}$                                       d)  $0.073\text{Å}$

25. When light travels from one medium to another, there is no change in ratio of its

- a) Velocity to wavelength                                      b) wavelength to time period  
c) time period to wave number                                      d) wave number to velocity

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**PAPER II - MATHEMATICS****I. SYLLABUS****PART - A: ALGEBRA**

CHAPTER 1- ELEMENTS OF NUMBER THEORY AND CONGRUENCES

CHAPTER 2- MATRICES AND DETERMINANTS

CHAPTER 3 – GROUPS

CHAPTER 4 – VECTORS

**PART – B: ANALYTICAL GEOMETRY**

CHAPTER 1- CIRCLES

CHAPTER 2- CONIC SECTIONS

**PART – C: TRIGONOMETRY**

CHAPTER 1 – INVERSE TRIGONOMETRIC FUNCTIONS

CHAPTER 2 – GENERAL SOLUTION OF TRIGONOMETRIC EQUATIONS

CHAPTER 3 – COMPLEX NUMBERS

**PART –D: DIFFERENTIAL CALCULUS**

CHAPTER 1 - DIFFERENTIATION

CHAPTER 2 – APPLICATIONS OF DERIVATIVES

CHAPTER 3 – MAXIMA AND MINIMA

**PART –E: INTERGRAL CALCULUS**

CHAPTER 1- INDEFINITE INTEGRALS

CHAPTER 2- DEFINITE INTEGRALS AND ITS APPLICATIONS

**PART –F: DIFFERENTIAL EQUATIONS**

CHAPTER 1 – DIFFERENTIAL EQUATIONS

## II MODEL QUESTION PAPER

1. Which of the following is false?

- a. Three distinct prime numbers can be in A P
- b. Three distinct prime numbers can never be in G P
- c. C. If  $p|ab$ ,  $p$  is prime &  $p|b$  then  $p|a$
- d.  $(n! + 1)$  is not divisible by any natural number between 2 and  $n$

2. The remainder obtained when  $64 \times 65 \times 66$  is divided by 67 is

- a. 60
- b. 61
- c. 62
- d. 64

3. In the group  $(Z, *)$  where  $a * b = a + b + 50$ . The inverse of 50 is

- a. -50
- b. 50
- c. 100
- d. -150

4. In the group  $\{3, 6, 9, 12\}$  under  $x \text{ mod } 15$ , the inverse of  $6^{100}$  is

- a. 3
- b. 6
- c. 9
- d. 12

5. 
$$\begin{vmatrix} \cos \frac{\pi}{12} & \sin \frac{\pi}{12} \\ \cos \frac{\pi}{4} & \sin \frac{\pi}{4} \end{vmatrix} - \begin{vmatrix} \cos \frac{\pi}{4} & \cos \frac{\pi}{12} \\ \sin \frac{\pi}{4} & \sin \frac{\pi}{12} \end{vmatrix} =$$

- a.  $\frac{9}{16}$
- b.  $\frac{3}{4}$
- c.  $\frac{3}{16}$
- d.  $\frac{1}{16}$

6. For the equations  $x + 2y + 3z = 0, 2x + y + 3z = 0, 5x + 5y + 9z = 4$

- A. there are infinitely many solutions
- B. there is a unique solution
- C. there is no solution
- D. there are exactly two solutions

7. If  $\Delta = \begin{vmatrix} 3 & 4 & 2 \\ 2 & 3 & 4 \\ 5 & 2 & 1 \end{vmatrix}$  and  $\Delta' = \begin{vmatrix} 2 & 3 & 5 \\ 3 & 4 & 2 \\ 4 & 2 & 1 \end{vmatrix}$ , then

- a.  $\Delta = \Delta'$
- b.  $\Delta = -\Delta'$
- c.  $\Delta = 2\Delta'$
- d.  $\Delta' = 2\Delta$

8 Let the vertices  $\vec{a}, \vec{b}, \vec{c}$  and  $\vec{d}$  such that  $(\vec{a} \times \vec{b}) \times (\vec{c} \times \vec{d}) = \vec{0}$

Let  $P_1$  and  $P_2$  be the planes determined by the pairs of vectors  $\vec{a}, \vec{b}$  and  $\vec{c}, \vec{d}$  respectively. Then the angle between  $P_1$  and  $P_2$  is

- a. 0
- b.  $\frac{\pi}{4}$
- c.  $\frac{\pi}{3}$
- d.  $\frac{\pi}{2}$

9. Let  $\vec{a} = 2i + j - 2k$  and  $\vec{b} = i + j$ . If  $\vec{c}$  is a vector such that  $\vec{a} \cdot \vec{c} = |\vec{c}|$ ,  $|\vec{c} - \vec{a}| = 2\sqrt{2}$

and the angle between  $(\vec{a} \times \vec{b})$  and  $\vec{c}$  is  $30^\circ$ , then  $|(\vec{a} \times \vec{b}) \times \vec{c}|$  is

- a.  $\frac{2}{3}$                                       b.  $\frac{3}{2}$                                       c. 2                                      d. 3

10. The set of all real numbers  $r$ , for which the two circles  $x^2 + y^2 - 2x - 4y + (5 - r^2) = 0$  and  $x^2 + y^2 - 2x + 6y - 15 = 0$  intersect exactly at two distinct points, is the interval

- a. (2, 8)                                      b. (0, 10)                                      c. (1, 9)                                      d. (3, 7)

11. The power of a point  $(x_1, y_1)$  w.r.t. the three circles  $a^2(x^2 + y^2) = 1$ ,  $b^2(x^2 + y^2) = 1$  and  $c^2(x^2 + y^2) = 1$  Are in A.P. Then  $a^2, b^2, c^2$  are in

- a. A.P                                      b. G.P                                      c. H.P                                      d. Cannot say

12. The eccentric angles ( $\varphi$ ) of the end points of LR of the ellipse  $\frac{x^2}{4} + y^2 = 1$  are given by  $\tan \varphi$

- a.  $\pm \frac{2}{\sqrt{3}}$                                       b.  $\pm \frac{\sqrt{3}}{2}$                                       c.  $\pm \frac{1}{2\sqrt{3}}$                                       d.  $\pm \frac{1}{\sqrt{3}}$

13. P is any point on the hyperbola  $\frac{(x-1)^2}{9} - \frac{(y+1)^2}{16} = 1$ . If  $S_1$  and  $S_2$  are its foci, then

$$|S_1P - S_2P| =$$

- a. 3                                      b. 4                                      c. 6                                      d. 8

14. If the ellipse  $\frac{x^2}{25} + \frac{y^2}{9} = 1$  and the parabola  $y^2 = 4(x - k)$ ,  $k > 0$ , touch each other, then  $k$  is

- a. 3                                      b. 5                                      c. 9                                      d. 25

15. Which of the following is TRUE?

- a. The modulus of  $\cosh x - i \sinh x$  is 1  
 b. For any complex number  $z$ , the value of  $z \bar{z}$  is always real  
 c. The number of solutions to the equation  $z^2 + \bar{z} = 0$  is 2.  
 d. The square of a complex number is always +ve







38. If the curves  $y = ax^3 + b$  and  $y = bx^2 + 1$  touch each other at  $x = -1$ , then  $a =$

- a. -4                                      b. 4                                      c. 0                                      d. -1

39. In  $A_n = \begin{pmatrix} n & n-1 \\ n-1 & n \end{pmatrix}$ , then  $\det(A_1) + \det(A_2) + \dots + \det(A_{2010}) =$

- a.  $2010^2$                                       b. 4019                                      c.  $2008^2$                                       d. 4021

40. If  $AB = A$  and  $BA = B$ , then  $B^2 + B =$

- a.  $2A$                                       b. 0                                      c.  $2I$                                       d.  $2B$

41  $\int_0^\pi [\cot x] dx =$

- a.  $\frac{\pi}{2}$                                       b. 1                                      c. -1                                      d.  $-\frac{\pi}{2}$

42. A population grows at the rate of 10% of the population per year. How long does it take for the population to double?

- a.  $20 \log 2$  years                                      b.  $10 \log 2$  years                                      c.  $5 \log 2$  years                                      d.  $2 \log 10$  years

43. The value of  $\int_{-2}^2 (|x - 3| + [x]) dx =$

- a. 12                                      b. 13                                      c. 10                                      d. 0

44. Let  $A$  be a  $3 \times 3$  symmetric matrix and  $B$  be a skew symmetric matrix of same order.

Further if  $(A + B)(A - B) = (A - B)(A + B)$  and  $(AB)' = (-1)^k AB$ , then  $k =$

- a. 1 or 3                                      b. 1 or 3                                      c. 2 or 3                                      d. is any odd integer

45. Let  $A = (a_{ij})$  be a square matrix of even order where  $a_{ij} = i^2 - j^2, \forall i, j$ . Then which of the following is true?

- a.  $A$  is a skew symmetric matrix and  $|A| = 0$   
 b.  $A$  is a skew symmetric matrix and  $|A|$  is a perfect square  
 c.  $A$  is a symmetric matrix and  $|A| = 0$   
 d.  $A$  is neither symmetric nor skew symmetric

46. If  $x_1, x_2, x_3, x_4$  are the roots of the equation  $x^4 - x^3 \sin 2\beta + x^2 \cos 2\beta - x \cos \beta - \sin \beta = 0$ ,

Then  $\sum_{i=1}^4 \tan^{-1} x_i =$

- a.  $\beta$                                       b.  $\left(\frac{\pi}{2}\right) - \beta$                                       c.  $\pi - \beta$                                       d.  $-\beta$

47.  $\sin^{-1} \frac{1}{\sqrt{2}} + \sin^{-1} \frac{\sqrt{2}-1}{\sqrt{6}} + \dots + \sin^{-1} \left[ \frac{\sqrt{n}-\sqrt{n-1}}{\sqrt{n(n+1)}} \right] + \dots \infty$  is

a.  $\frac{\pi}{3}$

b.  $\frac{\pi}{4}$

c.  $\frac{\pi}{6}$

d.  $\frac{\pi}{2}$

48. If  $x^2 + 1 = x$ , then  $x + x^2 + x^3 + x^4 + \frac{1}{x} + \frac{1}{x^2} + \frac{1}{x^3} + \frac{1}{x^4} =$

a. -5

b. -4

c. -2

d. -3

49. If  $\omega = \text{cis } \frac{2\pi}{3}$  and  $z = \text{cis } \frac{\pi}{2}$ , then  $\sum_{n=1}^{20} (\omega^n + z^{n+1}) =$

a. -1

b. 0

c.  $1 + i$

d.  $-1 + i$

50. The locus of the point of intersection of tangents to the circle  $x^2 + y^2 = a^2$  at the points whose parametric angles differ by  $60^\circ$  is

a.  $x^2 + y^2 = a^2$

b.  $x^2 + 4y^2 = 4a^2$

c.  $3(x^2 + y^2) = 4a^2$

d.  $x^2 + y^2 = 9$

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