Corporate Office : Aakash Tower, 8, Pusa Road, New Delhi-110005, Ph.011-47623456

Time : 3 Hrs. **MM : 120**

MOCK TEST

for

GUJCET (ENGINEERING)-2024

General Instructions:

1. This test paper consists of 120 questions of Physics, Chemistry and Mathematics.
2. Each subject contains 40 questions and each correct answer carries 1 mark and 0.25 mark will be deducted for each incorrect response.
3. Read each question carefully.
4. It is mandatory to use Blue/Black Ballpoint Pen to darken the appropriate circle in the answer sheet.
5. Mark should be dark and should completely fill the circle in the answer sheet.
6. Do not use white-fluid or any other rubbing material on answer sheet. No change in the answer once marked.
7. Rough work must not be done on the answer sheet.
8. Student cannot use log tables and calculators or any other material in the examination hall.
9. Before attempting the question paper, student should ensure that the test paper contains all pages and no page is missing.

PHYSICS

1. A sine voltage having maximum value of 283 V and frequency of 50 Hz is applied to LCR series connection where R = 3 Ω, L = 25.48 mH and C = 796 μF. Then impedence is _____ at resonance condition.

   (1) 3 Ω (2) 5 Ω

   (3) 15 Ω (4) 4 Ω

2. Resolving power of microscope is _____.

   (1) $\frac{1.22n\sin\beta}{2n\lambda}$ (2) $\frac{2\lambda}{1.22n\sin\beta}$

   (3) $\frac{1.22n}{2\lambda\sin\beta}$ (4) $\frac{1.22\lambda}{2n\sin\beta}$

3. The threshold frequency of Cesium is 5.16 × 10^{14} Hz. Then its work-function is _____ eV.

   (1) 1.12 (2) 2.14

   (3) 1.14 (4) 4.12

4. The ground state energy of hydrogen atom is –13.6 eV. What is the kinetic energy of electron in this state?

   (1) –27.2 eV (2) –13.6 eV

   (3) +13.6 eV (4) +27.2 eV

5. If charge q is placed on one of the vertex of a cube. Then flux passing through any one surface of cube adjacent to charge is _____.

   (1) $\frac{q}{\varepsilon_0}$ (2) $\frac{q}{6\varepsilon_0}$

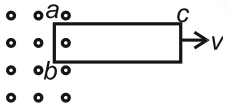
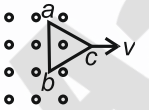
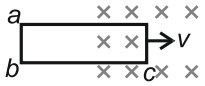
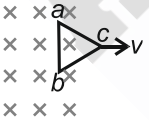
   (3) $\frac{q}{24\varepsilon_0}$ (4) None of these

6. If relative permittivity for any substance is 80 then its electric susceptibility is _____.
   (1) 79 (2) 7×10^{-10}
   (3) 7×10^{-9} (4) 81×10^{-10}

7. 2 μF capacitor is connected with 50 V supply and 3 μF capacitor is connected with 100 V supply. Now after removing battery if two plates of same type of charges are placed to form new capacitor then potential difference is _____V.
   (1) 200 (2) 333
   (3) 80 (4) 75

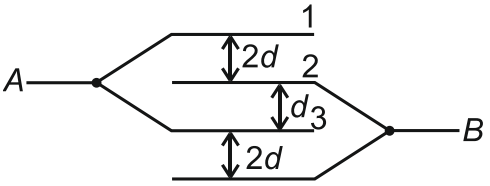
8. The emf of a car battery is 12 V and internal resistance of battery is 0.4 Ω then maximum power drawn from battery is _____W.
   (1) 4.8 (2) 360
   (3) 90 (4) Zero

9. 10 A current is passing through a very long wire of radius 5 cm. Then magnetic field at a distance of 2 cm inside from its curved surface is _____ $\times 10^{-5}$ T.
   (1) 2.4×10^{5} (2) 6.7×10^{-5}
   (3) 2.4×10^{-5} (4) 2.4

10. Out of the following given loops in which loop, the direction of induced current is from $a \rightarrow c \rightarrow b$?
   (1) 
   (2) 
   (3) 
   (4) 

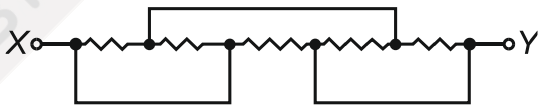
11. The angular spread of central maximum, in diffraction pattern, does not depend on ……..
   (1) Frequency of light
   (2) Wavelength of light
   (3) Width of slit
   (4) The distance between the slit and source

12. The wavelength of the first line of Lyman series is λ. The wavelength of the first line in Paschen series is …… λ.
   (1) $\frac{5}{27}$ (2) $\frac{7}{108}$
   (3) $\frac{27}{5}$ (4) $\frac{108}{7}$

13. In the figure, area of each plate is A and the distance between consecutive plates is as shown in the figure. What is the effective capacitance between points A and B?


   (1) $\frac{4A\varepsilon_0}{d}$ (2) $\frac{2A\varepsilon_0}{d}$
   (3) $\frac{3A\varepsilon_0}{d}$ (4) $\frac{A\varepsilon_0}{d}$

14. The heat produced per unit time, on passing electric current through a conductor at a given temperature, is directly proportional to the ……..
   (1) Reciprocal of electric current
   (2) Square of electric current
   (3) Reciprocal of square of electric current
   (4) Electric current

15. In the network shown in the figure, the equivalent resistance between points X and Y will be _____ Ω. Value of each resistance is 2 Ω.


   (1) $\frac{2}{3}$ (2) 1
   (3) 4 (4) 2

16. If in an A.C., L-C series circuit $X_C > X_L$. Hence potential ……
   (1) Lags behind the current by π in phase
   (2) Leads the current by $\frac{\pi}{2}$ in phase
   (3) Leads the current by π in phase
   (4) Lags behind the current by $\frac{\pi}{2}$ in phase

17. The dimensional formula of mobility is _____
   (1) $M^1L^{-1}T^{-2}A^{-1}$ (2) $M^1L^0T^{-2}A^{-1}$
   (3) $M^{-1}L^1T^2A^1$ (4) $M^{-1}L^0T^2A^1$

18. A galvanometer of resistance 50 Ω giving full scale deflection for a current of 10 milliampere is to be changed into voltmeter of range 100 V.
A resistance of _____Ω has to be connected in series with galvanometer.
(1) 10000 (2) 10025
(3) 9950 (4) 9975

19. The relation between B_v, B_h and B is _____
(1) $B = \frac{B_v}{B_h}$ (2) $B = B_h \cdot B_v$
(3) $B = \sqrt{B_h^2 + B_v^2}$ (4) $B = \frac{B_h}{B_v}$

20. A plano convex lens is made of material having refractive index 1.5. The radius of curvature of curved surface is 60 cm. The focal length of the lens is _____ cm.
(1) 60 (2) 120
(3) –60 (4) –120

21. Match Column I and Column II

Column I	Column II
(i) Interference	(P) Coherent sources
(ii) Brewster's Law	(Q) $\mu = \frac{1}{\sin C}$
(iii) Malus Law	(R) $\mu = \tan\theta_p$
(iv) Total internal reflection	(S) $I = I_0\cos^2\theta$

(1) i → Q, ii → S, iii → R, iv → P
(2) i → P, ii → R, iii → S, iv → Q
(3) i → P, ii → S, iii → R, iv → Q
(4) i → R, ii → Q, iii → S, iv → P

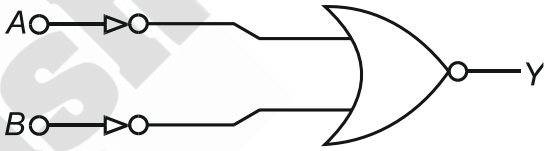
22. The energy of the fast neutrons emitted in a nuclear fission reactor is approximately
(1) 10 MeV (2) 2 keV
(3) 2 MeV (4) 20 MeV

23. In radioactive reaction as follows.
$${}^{A}_{Z}X \rightarrow {}^{A}_{Z+1}X_1 \rightarrow {}^{A}_{Z+2}X_2 \rightarrow {}^{A-4}_{Z}X_3 \rightarrow {}^{A-4}_{Z+1}X_4$$
Subsequent particle radiated will be.
(1) β^-, β^-, α, α (2) β^-, β^-, β^+, α
(3) β^-, β^-, β^-, α (4) β^-, β^-, α, β^-

24. A ray of light travelling in impure water is incident on a glass plate immersed in it. When the angle of incidence is 51°, the reflected ray is totally plane polarized. Given that refractive index of impure water is 1.4. The refractive index of glass should be_____ (tan51° = 1.235)
(1) 1.53 (2) 1.34
(3) 1.64 (4) 1.73

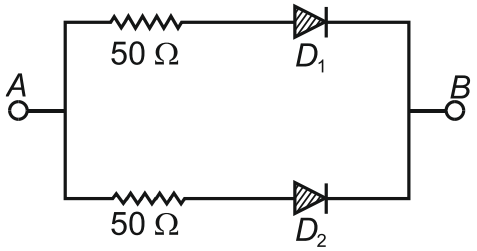
25. Half life of radioactive element is 5 min. At the end of 20 min its _____% quantity is disintegrated.
(1) 6.25 (2) 75
(3) 25 (4) 93.75

26. Which logic gate is represented by the following logic gates?



(1) NOR (2) NAND
(3) AND (4) OR

27. For the circuit shown in the figure, the equivalent resistance between points A and B for the two cases (i) $V_A > V_B$, (ii) $V_B > V_A$ respectively is _____ Ω and _____ Ω. (D_1 and D_2 are ideal diodes)



(1) 25, ∞ (2) 50, ∞
(3) ∞, 25 (4) 25, 25

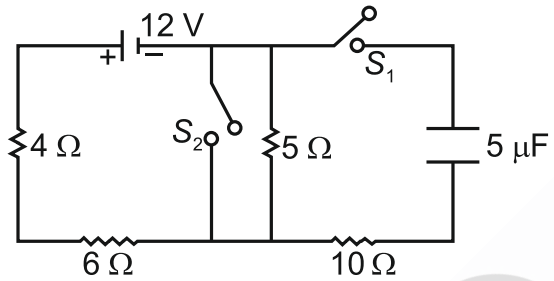
28. The amplitude of carrier wave is 12 V. For modulation index of 50%, the amplitude of modulating signal is _____ V.
(1) 3 (2) 6
(3) 12 (4) 9

29. Electric field intensity at points in between and outside two thin separated parallel sheets of infinite dimension with like charges of same surface charge density (σ) are ____ and _____ respectively.

(1) σ/ε_0, σ/ε_0 (2) 0, σ/ε_0

(3) 0, 0 (4) σ/ε_0, 0

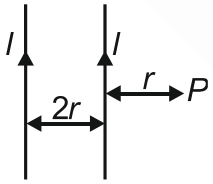
30. What is the current in the 4 Ω resistor when switch S_1 is open and switch S_2 is closed in the given circuit?



(1) 3.0 A (2) 0.8 A

(3) 1.5 A (4) 1.2 A

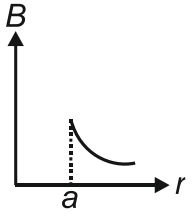
31. Two very long straight wires are set parallel to each other. Each carries a current I in the same direction and the separation between them is $2r$. The intensity of magnetic field at point P as shown in figure is _____.

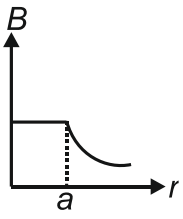


(1) $\frac{3}{8}\frac{\mu_0 I}{\pi r}$ (2) $\frac{2\mu_0 I}{\pi r}$

(3) $\frac{2}{3}\frac{\mu_0 I}{\pi r}$ (4) $\frac{\mu_0 I}{2\pi r}$

32. The magnetic field due to a straight long conductor of uniform cross-section of radius a and carrying a steady current is represented by

(1)


(2)


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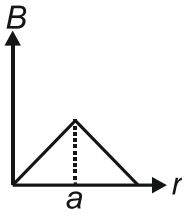
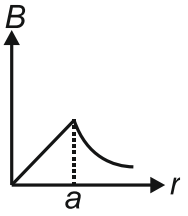


(4)


33. A proton is moving perpendicular to a uniform magnetic field of 2.5 tesla with 2 MeV kinetic energy. The force on proton is _____ N. (Mass of proton = 1.6×10^{-27} kg. Charge of proton = 1.6×10^{-19} C)

(1) 8×10^{-12} (2) 8×10^{-11}

(3) 3×10^{-11} (4) 3×10^{-10}

34. For the astronomical telescope, the focal length of objective lens is f_o and the eye piece lens is f_e. Then the tube length of the telescope is ___.

(1) $L \geq f_o - f_e$ (2) $L \geq f_o + f_e$

(3) $L < f_o + f_e$ (4) $L \leq f_o - f_e$

35. The number of turns in the coil of an A.C. generator are 100 and its cross-sectional area is 2.5 m^2. The coil is revolving in a uniform magnetic field of strength 0.3 T with the uniform angular velocity of 60 rad/s. The value of maximum voltage produced is _____kV.

(1) 1.25 (2) 4.50

(3) 6.75 (4) 2.25

36. An A.C voltage $V = 5 \cos (1000t)$ V is applied to an L-R series circuit of inductance 3 mH and resistance 4 Ω. The value of maximum current in the circuit is _____ A.

(1) 0.8 (2) 1.0

(3) $\frac{5}{7}$ (4) $\frac{5}{\sqrt{7}}$

37. In Young's double slit experiment, if the distance between two slits is equal to the wavelength of used light. Then the maximum number of bright fringes obtained on the screen will be

(1) Infinite (2) 3

(3) 7 (4) 5

38. A point charge q is situated at a distance r on axis from one end of a thin non-conducting rod of length L having a charge Q [Uniformly distributed along its length]. The magnitude of electric force between the two is _____.

(1) $\frac{KQq}{r^2}$

(2) $\frac{2KQ}{r(r+L)}$

(3) $\frac{KQq}{r(r-L)}$

(4) $\frac{KQq}{r(r+L)}$

39. de-Broglie wavelength of atom at T K absolute temperature will be

(1) $\frac{h}{\sqrt{3mk_BT}}$ (2) $\frac{h}{mk_BT}$

(3) $\frac{\sqrt{2mk_BT}}{h}$ (4) $\sqrt{2mk_BT}$

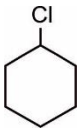
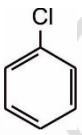
40. Two wires of equal length and equal diameter and having resistivities ρ_1 and ρ_2 are connected in series. The equivalent resistivity of the combination is ____.

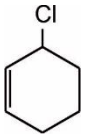
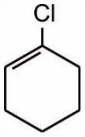
(1) $\frac{\rho_1+\rho_2}{2}$ (2) $(\rho_1+\rho_2)$

(3) $\frac{\rho_1\rho_2}{\rho_1+\rho_2}$ (4) $\sqrt{\rho_1\rho_2}$

CHEMISTRY

41. Which of the following is most reactive for S_N1 reaction?

(1)  (2) 

(3)  (4) 

42. Among the electrolytes Na_2SO_4, $CaCl_2$, $Al_2(SO_4)_3$ and NH_4Cl, the most effective coagulating agent for Sb_2S_3 sol is

(1) NH_4Cl (2) $CaCl_2$

(3) $Al_2(SO_4)_3$ (4) Na_2SO_4

43. If the specific conductance and conductance of an electrolytic solution respectively are 0.2 Ω^{-1} cm^{-1} and 0.8 Ω^{-1} then cell constant is

(1) 0.25 cm^{-1}

(2) 0.5 cm^{-1}

(3) 0.4 cm^{-1}

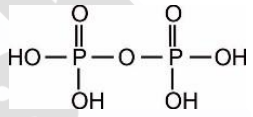
(4) 0.8 cm^{-1}

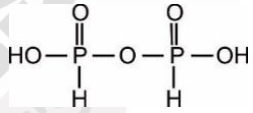
44. Which of the following metal can be purified by Mond's process?

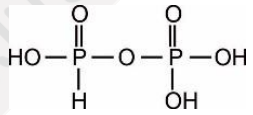
(1) Ti (2) Zr

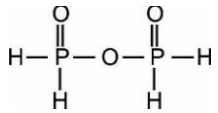
(3) Zn (4) Ni

45. Which of the following is pyrophosphoric acid?

(1) 

(2) 

(3) 

(4) 

46. Which among the following aqueous solutions has the highest boiling point?

(1) 0.1 M $NaNO_3$ (α = 1)

(2) 0.2 M Na_3PO_4 (α = 1)

(3) 0.1 M Na_2SO_4 (α = 1)

(4) 0.1 M urea

47. The predicted cell potential of the electrochemical cell

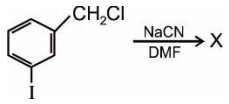
$Fe(s)\,|\,Fe^{2+}_{(aq)},(0.01M)\,||\,Cd^{2+}_{(aq)},0.01M\,|\,Cd(s).$

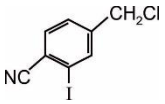
$E^{o}_{Fe^{2+}/Fe} = -0.447$ V and $E^{o}_{(Cd^{2+}/Cd)} = -0.403$ V, is

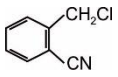
(1) –0.0850 V (2) +0.850 V

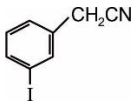
(3) –0.044 V (4) +0.044 V

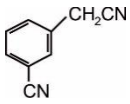
48. Identify X from the following reaction:



(1) 

(2) 

(3) 

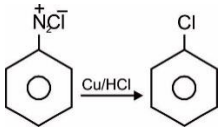
(4) 

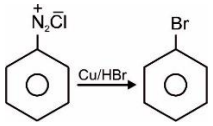
49. Which carbon-halogen bond has the lowest bond enthalpy?

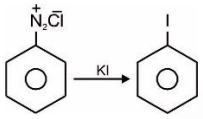
(1) C — Br (2) C — Cl

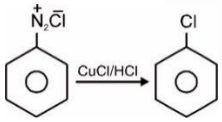
(3) C — F (4) C — I

50. Which of the following reactions is Sandmeyer reaction?

(1) 

(2) 

(3) 

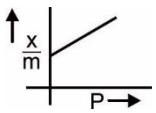
(4) 

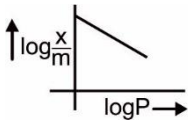
51. Which of the following element of group 16 is radioactive?

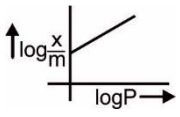
(1) Polonium (2) Sulphur

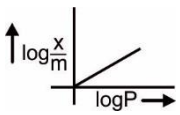
(3) Oxygen (4) Selenium

52. For freundlich adsorption isotherm which is a correct graph?

(1) 

(2) 

(3) 

(4) 

53. Among the following substituted silanes the one which will give rise to cross linked silicone polymer on hydrolysis is

(1) R_4Si (2) $RSiCl_3$

(3) R_2SiCl_2 (4) R_3SiCl

54. Colour observed in $KMnO_4$ molecule is due to

(1) Charge transfer spectra

(2) *d-d* transition

(3) Colour of K^+ ion

(4) Both (1) and (2)

55. Units of rate constant for first and zero order reaction in terms of molarity 'M' unit are respectively

(1) s^{-1}, Ms^{-1} (2) s^{-1}, M

(3) Ms^{-1}, s^{-1} (4) M, s^{-1}

56. Which of the following is correct for lyophillic sol?

(1) Irreversible sol

(2) Formed from inorganic substances

(3) Readily coagulated by addition of electrolyte

(4) Self stabilized

57. The probable formula for prussian blue is

(1) $Fe_3[Fe(CN)_6]_2$ (2) $Fe_2[Fe(CN)_6]_3$

(3) $Fe_4[Fe(CN)_6]_3$ (4) $Fe_3[Fe(CN)_6]_4$

58. What is the primary valency of metal ion in the complex $\left[Co(en)_2Cl_2\right]NO_3$?

(1) 4 (2) 3

(3) 2 (4) 5

59. Which of the following is paramagnetic in nature?

(1) $[Ni(CN)_4]^{2-}$ (2) $[Fe(CN)_6]^{4-}$

(3) $[CoF_6]^{3-}$ (4) $[Ni(CO)_4]$

60. If the atoms/ions in the crystal are taken to be hard spheres touching each other in the unit cell, then the fraction of volume occupied by atoms/ions in the body centered cubic structure is

(1) $\frac{\sqrt{2}\pi}{6}$ (2) $\frac{\pi}{6}$

(3) $\sqrt{3}\pi$ (4) $\frac{\sqrt{3}\pi}{8}$

61. What volume of 0.8 M solution contains 0.1 mole of the solute?

(1) 100 ml (2) 125 ml

(3) 500 ml (4) 62.5 ml

62. Osmotic pressure observed when benzoic acid is dissolved in benzene, is less than expected from theoretical considerations. This is because
(1) Benzoic acid is an organic solute
(2) Benzoic acid has lighter molar mass than benzene
(3) Benzoic acid gets associated in benzene
(4) Benzoic acid gets dissociated in benzene

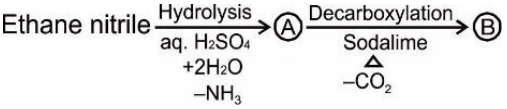
63. van't Hoff factor for 0.1 M $Ba(NO_3)_2$ solution is 2.74. Find its degree of dissociation.
(1) 91.3% (2) 87%
(3) 100% (4) 74%

64. Which of the following solution of KCl has the lowest value of specific conductance?
(1) 1 M (2) 0.1 M
(3) 0.01 M (4) 0.001 M

65. The equivalent conductivity of 0.1 N CH_3COOH at 25°C is 80, and at infinite dilution it is 400. What will be the degree of dissociation of CH_3COOH?
(1) 1 (2) 0.2
(3) 0.1 (4) 0.5

66. Teflon has monomeric unit of
(1) Isoprene
(2) Tetrafluoroethene
(3) Glycol
(4) Vinyl cyanide

67. Identify A and B in the reaction given below :



(1) Ethanoic acid, Methane
(2) Ethanoic acid, Ethane
(3) Acetone, Methane
(4) Acetic acid, Methanol

68. On electrolysis of 10^{-6} M HCl solution
(1) Cl_2 gas is produced at the cathode
(2) Cl_2 gas is produced at the anode
(3) O_2 gas is produced at the cathode
(4) H_2 gas is produced at the cathode

69. Aluminium is obtained by
(1) Reducing Al_2O_3 with coke
(2) Heating Al_2O_3 and NaCl
(3) Electrolysing Al_2O_3 dissolved in cryolyte in fused state
(4) Reducing Al_2O_3 with CO_2

70. The most abundant transition metal in earth crust is
(1) O (2) Al
(3) Fe (4) Au

71. What is the correct order of boiling point of isomeric 1°, 2° and 3° alcohol?
(1) 1° > 2° > 3° (2) 3° > 2° > 1°
(3) 2° > 1° > 3° (4) 2° > 3° > 1°

72. What is the number of precipitable halide ions in $[Pt(NH_3)Cl_2Br]Cl$?
(1) 2 (2) 3
(3) 4 (4) 1

73. Which of the following reagents is suitable for distinguishing phenol and cyclohexanol?
(1) 2, 4-DNP
(2) Sodium bicarbonate
(3) $FeCl_3$ (neutral)
(4) Tollen's reagent

74. The correct decreasing reactivity order towards nucleophilic addition for the following compounds is
CH_3CHO, CH_3COCH_3, HCHO, $C_2H_5COCH_3$.
(1) CH_3CHO > HCHO > CH_3COCH_3 > $C_2H_5COCH_3$
(2) HCHO > CH_3CHO > CH_3COCH_3 > $C_2H_5COCH_3$
(3) CH_3CHO > CH_3COCH_3 > $C_2H_5COCH_3$ > HCHO
(4) CH_3COCH_3 > $C_2H_5COCH_3$ > CH_3CHO > HCHO

75. Deficiency of which vitamin causes Pernicious anaemia?
(1) E (2) K
(3) B_{12} (4) A

76. Which monomer is used for preparation of ORLON (PAN)?
(1) $F_2C=CF_2$
(2) $H_2C=CH-CN$
(3) $H_2C=CH-Cl$
(4) $H_2C=CH-OH$

77. Proteins are hydrolysed by enzymes into
(1) Dicarboxylic acids
(2) Hydroxy acids
(3) Amino acids
(4) Aromatic acids

78. $RCOOAg + Br_2 \xrightarrow[\Delta]{CCl_4} R-Br + AgBr + CO_2$.
This reaction is called
(1) Wurtz reaction
(2) Hunsdiecker reaction
(3) Friedel-Crafts reaction
(4) Kolbe's reaction

79. The rate of esterification of acetic acid with methyl alcohol (i), ethyl alcohol (ii), isopropyl alcohol (iii), and tertiary butyl alcohol (iv) follows in the order
(1) i > ii > iii > iv
(2) iv > iii > ii > i
(3) ii > i > iv > iii
(4) iii > iv > i > ii

80. Which of the following gives positive iodoform test?
(1) $CH_3 - CH_2 - CHO$
(2) $CH_3 - CH_2 - \overset{\overset{O}{\|}}{C} - CH_2 - CH_3$
(3) $CH_3 - CH_2 - OH$
(4) $C(CH_3)_3 - CH_2OH$

MATHEMATICS

81. Let $f(x) = 1 - \frac{1}{x}$, then $f\left(f\left(\frac{1}{x}\right)\right)$ is
(1) $\frac{1}{x}$ (2) $\frac{1}{1+x}$
(3) $\frac{x}{x-1}$ (4) $\frac{1}{x-1}$

82. $y = 10^x$ is the reflection of $y = \log_{10} x$ in the line
(1) $x + y = 0$ (2) $10x - y = 0$
(3) $x - y = 0$ (4) $x - 10y = 0$

83. Let R be the relation on the set of real numbers defined by $aRb \Leftrightarrow |a-b| \le 1$, then R is
(1) Reflexive and symmetric
(2) Symmetric only
(3) Reflexive only
(4) Equivalence relation

84. A vertex of the linear inequations $2x + 3y \le 6$, $x + 4y \le 4$, $x, y \ge 0$, is
(1) (1, 0) (2) (1, 1)
(3) $\left(\frac{12}{5}, \frac{2}{5}\right)$ (4) $\left(\frac{2}{5}, \frac{12}{5}\right)$

85. The value of $\operatorname{cosec}\left(\sin^{-1}\frac{1}{2} + \cos^{-1}\frac{1}{2}\right)$ is
(1) –1 (2) 1
(3) $\frac{1}{2}$ (4) $\frac{\sqrt{3}}{2}$

86. If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$, where '$a$' is a constant, then $\frac{dy}{dx}$ is
(1) $\frac{-\sqrt{1-x^2}}{\sqrt{1-y^2}}$ (2) $\frac{\sqrt{1-x^2}}{\sqrt{1-y^2}}$
(3) $\frac{-\sqrt{1-y^2}}{2\sqrt{1-x^2}}$ (4) $\frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$

87. If $\cos\left(2\sin^{-1}x\right) = \frac{1}{5}$, then x is
(1) $\pm\sqrt{\frac{3}{5}}$ (2) $\pm\frac{1}{\sqrt{5}}$
(3) $\pm\sqrt{\frac{2}{5}}$ (4) $\pm\frac{2}{\sqrt{5}}$

88. If $3\tan^{-1}x + \cot^{-1}x = \pi$, then the value of x is
(1) 1 (2) –1
(3) $\frac{1}{\sqrt{3}}$ (4) $\sqrt{3}$

89. $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ is equal to
(1) (1 + x)(1 + y) (2) xy
(3) $x + y$ (4) $x - y$

90. If $x \geq 0$ and $\theta = \sin^{-1}(x) + \cos^{-1}(x) - \tan^{-1}(x)$, then

(1) $\frac{\pi}{2} \leq \theta \leq \frac{3\pi}{4}$

(2) $0 \leq \theta \leq \frac{\pi}{4}$

(3) $0 < \theta \leq \frac{\pi}{2}$

(4) $\frac{\pi}{4} \leq \theta \leq \frac{\pi}{2}$

91. The minimum distance of the curve $x^2 + 2y^2 = 6$ from the line $x + y = 7$ is

(1) $3\sqrt{2}$ (2) $2\sqrt{2}$

(3) $4\sqrt{2}$ (4) $\sqrt{2}$

92. If $A = \begin{bmatrix} 2 & -1 & 3 \\ 4 & 1 & 2 \\ 1 & -1 & 5 \end{bmatrix}$, then $A(\text{adj}A)$ is

(1) $\begin{bmatrix} 17 & 1 & 1 \\ 1 & 17 & 1 \\ 1 & 1 & 17 \end{bmatrix}$ (2) $\begin{bmatrix} 1 & 17 & 17 \\ 17 & 1 & 17 \\ 17 & 17 & 1 \end{bmatrix}$

(3) $\begin{bmatrix} 17 & 0 & 0 \\ 0 & 17 & 0 \\ 0 & 0 & 17 \end{bmatrix}$ (4) $\begin{bmatrix} 0 & 0 & 17 \\ 0 & 17 & 0 \\ 17 & 0 & 0 \end{bmatrix}$

93. If $f(x) = x^{\alpha}\log_e x$ and $f(0) = 0$, then the value of 'α' for which Rolle's theorem can be applied in (0, 1] is

(1) –1 (2) –2

(3) Zero (4) $\frac{1}{2}$

94. If $x^2 + y^2 + z^2 = r^2$ and $x, y, z > 0$, then $\tan^{-1}\left(\frac{xy}{zr}\right) + \tan^{-1}\left(\frac{yz}{xr}\right) + \tan^{-1}\left(\frac{zx}{yr}\right)$ is equal to

(1) π (2) $\frac{\pi}{2}$

(3) Zero (4) $\frac{\pi}{6}$

95. $\int \frac{f(x)}{\log(\cos x)}dx = -\log(\log\cos x) + c$, then $f'(x)$ is

(1) $-\sin x$ (2) $\cos x$

(3) $\tan x$ (4) $\sec^2 x$

96. $\int_0^1 x(1-x)^n dx$ is equal to

(1) $\frac{1}{n+1}$

(2) $\frac{1}{n+2}$

(3) $\frac{1}{(n+1)(n+2)}$

(4) $\frac{2n+3}{(n+1)(n+2)}$

97. $\int_0^{\frac{\pi}{2}} \log_e(\tan x + \cot x)dx$ is equal to

(1) $\frac{-\pi}{2}\log_e(2)$

(2) $-\pi\log_e(2)$

(3) $\frac{\pi}{2}\log_e(2)$

(4) $\pi\log_e(2)$

98. If $f(x) = x + \sin x$ and $g(x)$ be the inverse function of $f(x)$, then $\int_0^{\pi} g(x)\,dx$ is equal to

(1) $\frac{\pi^2}{2}$

(2) $\frac{\pi^2}{2} - 1$

(3) $\frac{\pi^2}{2} + 1$

(4) $\frac{\pi^2}{2} - 2$

99. The value of $\int_{-\pi/2}^{\pi/2} f(\cos x)dx$, where $f(x)$ is an odd function is

(1) Zero

(2) $\int_0^{\pi/2} f(\cos x)dx$

(3) $2\int_0^{\pi/2} f(\sin x)dx$

(4) $2\int_0^{\pi} f(\cos x)dx$

100. The area bounded by the curves $x^2 = 4y + 4$ and $3x + 4y = 0$ is

(1) $\frac{25}{4}$ sq. units

(2) $\frac{125}{8}$ sq. units

(3) $\frac{125}{16}$ sq. units

(4) $\frac{125}{24}$ sq. units

101. The area bounded by curves $y = |\sin x|$, x-axis and $|x| = \pi$ is

(1) 2

(2) 3

(3) 4

(4) 6

102. The area bounded by the curves $y = ex \ln x$ and $y = \frac{\ln x}{ex}$ is

(1) $\left(\frac{e}{4} + \frac{5}{4e}\right)$ sq. units

(2) $\left(\frac{e}{4} - \frac{5}{4e}\right)$ sq. units

(3) $\left(\frac{e}{4} - \frac{4}{5e}\right)$ sq. units

(4) $\left(\frac{e}{4} + \frac{4}{5e}\right)$ sq. units

103. The area in the first quadrant between $x^2 + y^2 = \pi^2$ and $y = \sin x$ and y-axis is

(1) $\frac{\pi^3 - 8}{4}$

(2) $\frac{\pi^3}{4}$

(3) $\frac{\pi^3 - 16}{4}$

(4) $\frac{\pi^3 - 8}{2}$

104. The subtangent to the curve $x^m y^n = a^{m+n}$ at any point (x, y) is

(1) $\frac{-mx}{y}$

(2) $\frac{-ny}{m}$

(3) $\frac{-mx}{n}$

(4) $\frac{-nx}{m}$

105. The solution of differential equation $\frac{dy}{dx} + 2y \tan x = \sin x$ is

(1) $y \sec^3 x = \sec^2 x + c$

(2) $y \sec^2 x = \sec x + c$

(3) $y \sin x = \tan x + c$

(4) $y \sec^2 x = \sec x \tan x + c$

106. If the length of the subnormal of a curve is constant and if it passes through the origin, then the curve is

(1) Circle

(2) Parabola

(3) Ellipse

(4) Hyperbola

107. The solution of differential equation $\left(xe^{\frac{y}{x}} + y\right)dx = x\,dy$ is

(1) $ye^{x/y} = (\log c)(x)$

(2) $xe^{-x/y} = (\log c)(x)$

(3) $-e^{x/y} = \log(cx)$

(4) $-e^{-y/x} = \log(cx)$

108. The angle between any two body diagonals of a cube is

(1) $\cos^{-1}\left(\frac{1}{3}\right)$

(2) $\cos^{-1}\left(\sqrt{\frac{2}{3}}\right)$

(3) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

(4) $\cos^{-1}\left(\frac{2}{3}\right)$

109. The direction ratio of the line $\frac{3-x}{1}=\frac{y-2}{5}=\frac{2z-3}{1}$ is

(1) –1 : 5 : 1

(2) 1 : 5 : 1

(3) $1 : 5 : \frac{1}{2}$

(4) $-1 : 5 : \frac{1}{2}$

110. If the direction ratios of two lines are given by $l + m + n = 0$, $mn + lm = 2ln$, then the angle between the lines, is

(1) $\frac{\pi}{4}$

(2) $\frac{\pi}{2}$

(3) $\frac{\pi}{3}$

(4) $\frac{\pi}{6}$

111. The measure of the angles between the lines $x = k + 1$, $y = 2k - 1$, $z = 2k + 3$, $k \in R$ and $\frac{x-1}{2}=\frac{y+1}{1}=\frac{z-1}{-2}$ is

(1) $\sin^{-1}\left(\frac{4}{3}\right)$

(2) $\cos^{-1}\left(\frac{4}{9}\right)$

(3) $\frac{\pi}{2}$

(4) $\sin^{-1}\frac{\sqrt{5}}{3}$

112. If $px^4 + qx^3 + rx^2 + sx + t =$

$\begin{vmatrix} x^2+3x & x-1 & x+3 \\ x+1 & -2x & x-4 \\ x-3 & x+4 & 3x \end{vmatrix}$, then the value of t is

(1) Zero

(2) 1

(3) 2

(4) –1

113. If the equations $x + ay - z = 0$, $ax + y + 2z = 0$, $2x - y + az = 0$ have non-trivial solutions, then the value of a is

(1) –2

(2) 2

(3) 1

(4) –1

114. A speaks truth in 75% of cases and B in 80% of cases, then the percentage of cases they are likely to contradict each other in stating the same fact, is

(1) 30%

(2) 35%

(3) 40%

(4) 25%

115. $f(x)=(x-a)^2+(x-b)^2+(x-c)^2$ has minimum value at x =

(1) $\sqrt[3]{abc}$

(2) $a + b + c$

(3) $\frac{a+b+c}{3}$

(4) Zero

116. The volume of the parallelopiped whose sides are given by $\overrightarrow{OA}=2\vec{i}-3\vec{j}$, $\overrightarrow{OB}=\vec{i}+\vec{j}-\vec{k}$, $\overrightarrow{OC}=3\vec{i}-\vec{k}$ is

(1) $\frac{4}{13}$ cubic units

(2) 8 cubic units

(3) $\frac{2}{7}$ cubic units

(4) 1 cubic unit

117. $f(x)=\tan^{-1}x-x$ is

(1) Increasing on R

(2) Decreasing on R

(3) Increasing on R^+

(4) Decreasing on $(-\infty, 0)$

118. If $\vec{a}\cdot\vec{b}=0, \vec{a}\times\vec{b}=\vec{c}$, where $\vec{a}=\vec{i}-\vec{j}+\vec{k}$ and $\vec{c}=-2\vec{i}-\vec{j}+\vec{k}$, then $\vec{b}$ is

(1) $-\vec{i}+\vec{k}$ (2) $-\vec{i}-\vec{j}$

(3) $\vec{j}+\vec{k}$ (4) $\vec{i}-\vec{k}$

119. The area of parallelogram whose diagonals are $\hat{j}+\hat{k}$ and $\hat{i}+\hat{k}$ is

(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{3}{2}$

(3) 3 (4) $\sqrt{3}$

120. The angle between diagonals of a cube is

(1) $\cos^{-1}\left(\frac{1}{3}\right)$

(2) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

(3) $\frac{\pi}{4}$

(4) $\frac{\pi}{3}$

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