JEE MAIN-2024-25 (Part Test-1)

(Physics, Chemistry and Mathematics)

SYLLABUS

Physics :- Electric Charge & Fields, Electrostatics, Capacitance, Current Electricity
Chemistry :- Solutions
Mathematics :- Relation & Function, ITF, Matrices & Determinants

1
PART TEST

CLASS-XIIth

Date :- ..... **Time :- 3:00 Hrs.** **Marks :- 300**

Important Instructions :

1. The test duration is of **3 hours**.
2. The Test Booklet consists of 90 questions. The maximum marks are 300.
3. There are **three** parts in the question paper consisting of **Physics, Chemistry** and **Mathematics** having 30 questions in each part of equal weightage. Each part (subject) has two sections.

   (i) **Section-A:** This section contains 20 multiple choice questions which have only one correct answer. Each question carries **4 marks** for correct answer and **–1 mark** for wrong answer.
   (ii) **Section-B:** This section contains 10 questions. In Section-B, attempt any **five questions out of 10.** The answer to each of the questions is a numerical value. Each question carries **4 marks** for correct answer and **–1 mark** for wrong answer. For Section-B, the answer should be rounded off to the nearest integer.

Student's Name :- .....
School Name :- .....

Student's Signature :- ..... **Invigilator's Signature :- .....**

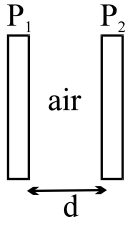
PHYSICS

SECTION-A

1. A conducting sphere of radius 10 cm is charged with 10 C. Another uncharged sphere of radius 20 cm is allowed to touch it for some time. After that if the spheres are separated, then surface density of charges on the spheres will be in the ratio of

(A) 1 : 4 (B) 1 : 3 (C) 1 : 2 (D) 1 : 1

2. Two conducting large plates P_1 & P_2 are placed near to each other at very small separation 'd'. The plate area of either face of plate is A. Now a charge +2Q is given to plate P_1 & –Q to the plate P_2 (neglect ends effects). Potential difference between the plates P_1 & P_2



(A) $\frac{Qd}{2\epsilon_0 A}$ (B) $\frac{3Qd}{2\epsilon_0 A}$

(C) $\frac{Qd}{\epsilon_0 A}$ (D) $\frac{Qd}{4\epsilon_0 A}$

3. A point charge –Q is revolving around a circle of radius r due to electrostatic force exerted by the charge +Q kept fixed at the center of the circle. Kinetic energy of the revolving particle is:

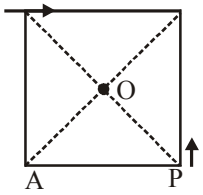
(A) $\frac{KQ}{r}$ (B) $\frac{KQ^2}{2r}$ (C) $\frac{KQ^2}{3r}$ (D) $\frac{KQ^2}{4r}$

4. Millikan's oil drop experiment attempts to measure the charge on a single electron, e, by measuring the charge of tiny oil drops suspended in an electrostatic field. It is assumed that the charge on the oil drop is due to just a small number of excess electrons. The charges 3.90×10^{-19} C, 6.50×10^{-19} C and 9.10×10^{-19} C are measured on three drops of oil. The charge of an electron is deduced to be,

(A) 1.3×10^{-19} C (B) 1.6×10^{-19} C
(C) 2.6×10^{-19} C (D) 3.9×10^{-19} C

5. An electric dipole is kept in a uniform electric field.
(A) the force on it is zero in any configuration but the torque on it is zero only in a special configuration
(B) the torque on it is zero in any configuration but the force on it is zero only in a special configuration
(C) the force as well as torque on it is zero only in a special configuration
(D) the force as well as torque on it is zero in any configuration.

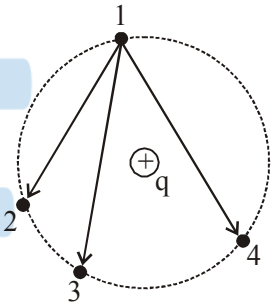
6. Two short dipoles of dipole moment p are placed at two corners of a square as shown in the figure. What is the ratio of magnitudes of electric field at two points O and A ?



(A) 2 (B) $2\sqrt{2}$

(C) 1 (D) $\sqrt{2}$

7. In the electrostatic field of a point charge q from point 1(Figure) we moved one and the same charge to points 2, 3, 4. Find work done on the charge during the movement in each case and compare them.



(A) $W_2 < W_3 > W_4$
(B) $W_2 < W_3 < W_4$
(C) $W_2 = W_3 = W_4$
(D) $W_2 = W_4 < W_3$

8. Imagine that a small hole has been punched through the wall of a thin, uniformly charged spherical shell whose surface charge density is σ. Find the electric field near the center of the hole, out side the shell.

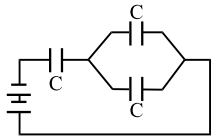
(A) $\frac{\sigma}{\epsilon_0}$ (B) $\frac{\sigma}{4\epsilon_0}$

(C) zero (D) $\frac{\sigma}{2\epsilon_0}$

9. If a rectangular area is rotated in a uniform electric field from the position where the maximum electric flux goes through it to an orientation where only half the maximum flux goes through it, what has been the angle of rotation?

(A) 30° (B) 60° (C) 45° (D) 26.6°

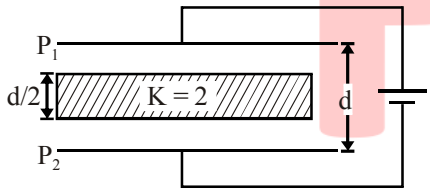
10. Three identical capacitors each with a capacitance of C are connected as shown in the following figure. What would be the total equivalent capacitance of the circuit?



(A) 0.33 C (B) 0.67 C
(C) 1 C (D) 1.5 C

11. A parallel plate capacitor is charged using a battery, and the battery is then removed. The plates of the capacitor are then brought closer together. Which of the following statements is false ?
(A) The electric field inside the capacitor remains the same
(B) The capacitance of the capacitor increases
(C) The charge on the capacitor remains the same
(D) The energy stored in the capacitor increases

12. In the figure shown a parallel plate capacitor has a dielectric of width d/2 and dielectric constant K = 2. The other dimensions of the dielectric are same as that of the plates. The plates P_1 and P_2 of the capacitor have area 'A' each.



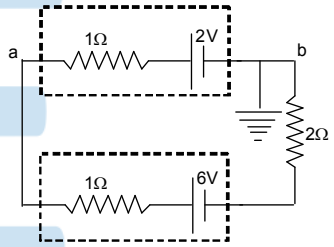
(A) The capacitance of capacitor is $\frac{4\epsilon_0 A}{3d}$
(B) The energy stored in capacitor is 0
(C) The electric field inside dielectric is $\frac{1}{8}$ of electric field outside it
(D) The energy stored in dielectric region is equal to the energy outside.

13. A photographic flash unit consists of a Xenon-filled flash tube energised by the discharge of a capacitor, previously charged by a 1000 V source. The average power delivered to the tube is 2000 W in a time of 0.04 s. The capacitance of the capacitor can be estimated as :
(A) 40×10^{-6} F (B) 80×10^{-6} F
(C) 160×10^{-6} F (D) None of these

14. **Statement-1 :** To measure the current in a circuit element, the ammeter should be connected in series with that element.
Statement-2 : The resistance of ammeter is less than that of galvanometer used to make the ammeter.
(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
(C) Statement-1 is true, statement-2 is false.
(D) Statement-1 is false, statement-2 is true.

15. Two scales on a voltmeter measure voltages up to 20.0 V and 30.0 V. The resistance connected in series with the galvanometer is 1680Ω for the 20.0 V scale and 2930Ω for the 30.0 V scale. The resistance of the galvanometer and the full scale current are respectively
(A) 320 Ω and 10 mA (B) 70 Ω and 10 mA
(C) 820 Ω and 10 mA (D) 820 Ω and 8 mA

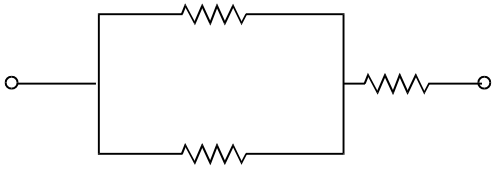
16. In the adjacent figure, internal resistance of each cell is 1Ω. The potential difference $V_a - V_b$ is



(A) $\frac{5}{2}$ V (B) 1 V (C) 3V (D) $\frac{-3}{2}$ V

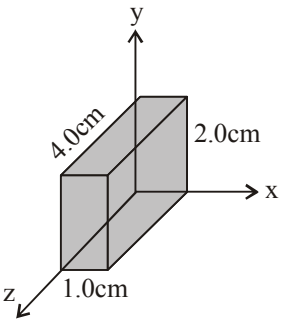
17. Suppose that a load resistor R_L is connected across the terminals of a real battery. The power dissipated in the load resistor
(A) will increase when R_L is increased
(B) will decrease when R_L is increased
(C) may increase or decrease when R_L is increased, depending on the initial value of R_L
(D) may decrease or stay the same, depending on the initial value of R_L

18. Each of the three resistors connected in a circuit as shown below has a resistance of 2Ω and can dissipate a maximum of 18W without becoming excessively heated. The maximum power that the circuit can dissipate is :



(A) 54W (B) 36W (C) 18W (D) 27W

19. A rectangular solid made of carbon has sides of lengths 1.0 cm, 2.0 cm, and 4.0 cm, lying along the x, y, and z axes, respectively. Determine the resistance for current that passes through the solid in the x-direction. $\rho = 3 \times 10^{-3}\ \Omega m$.



(A) $\frac{3}{20}\Omega$ (B) $\frac{3}{5}\Omega$ (C) $\frac{2}{5}\Omega$ (D) $\frac{3}{80}\Omega$

20. A piece of copper and another of germanium are cooled from room temperature to 80 K. The resistance of :

(A) each of the them increases

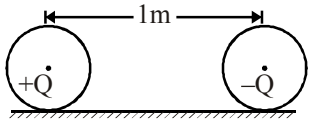
(B) each of them decreases

(C) copper increases and germanium decreases

(D) copper decreases and germanium increases

SECTION-B

21. Two point charges are embedded inside two identical insulated smooth balls kept on horizontal ground as shown. The balls have radius of 10 cm each and are initially kept at a distance of 1m as shown. They move under the influence of mutual attraction collide with $e = \frac{1}{2}$. What is the maximum distance between their centers (in cm) after 1st collision?



22. A positively charged particle starts at rest 25cm from a second positively charged particle which is held stationary throughout the experiment. The first particle is released and accelerates directly away from the second particle. When the first particle has moved 25cm, it has reached a velocity of $10\sqrt{2}$ m/s. What is the maximum velocity (in m/s) that the first particle will reach ?

23. Potential in the x-y plane is given as $V = 4(x^2 + xy)$ volts. Find the electric field (in N/C) at the point (1,–2).

24. A thin spherical soap bubble has surface tension S. It's surface is charged with charge Q, it's volume is V. It is found that when $Q^2 = n\pi\varepsilon_0 SV$, the excess pressure inside the bubble becomes zero. Find n.

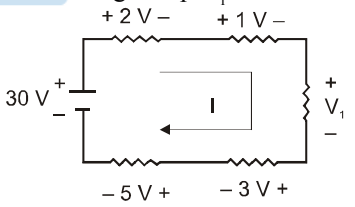
25. Two pointlike particles of charge Q are fixed at two of the vertices of an equilateral triangle of sides ℓ. At the third vertex a third particle of mass m and of charge q is released. What is the initial acceleration (in m/s^2) of this particle ? Round off the answer to nearest integer.

(Data : ℓ =10 cm, m = $\sqrt{3}$ mg, Q = 10^{-8} C, q = 10^{-9} C).

26. A 4 μF and a 9 μF capacitor are connected in series across a 26 V battery. What is voltage of the battery required to charge a parallel combination of the two capacitors to the same total energy ?

27. An ameter is connected in series with an unknown resistance and a voltmeter is connected across the terminals of the resistance. If this ameter reads 1.2A and voltmeter reads 6V. What is the value of the resistance (in Ω)? Assume ideal meters.

28. For the circuit shown in figure, determine the unknown voltage drop V_1.



29. A constant valtage is applied between two ends of a metallic wire. If the length is halved and the radius of the wire is doubled, the rate of heat developed in the wire will be

30. Two equal resistances when connected in series to a battery consume electric power of 60 W. If these resistances are now connected in parallel combination to the same battery, the electric power consumed will be

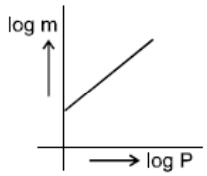
31. The density of ice differs from that of water because
(A) ice is a solid and water is a liquid
(B) hydrogen bonding exists only in water
(C) ice has an open cage-like structure
(D) ice is covalently bonded but water involves ionic bonding

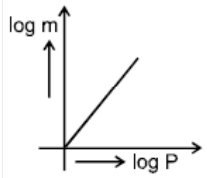
32. The mole fraction of NaCl in a solution containing 1 mole of NaCl in 1000 g of water is-
(A) 0.0177 (B) 0.001 (C) 0.5 (D) 0.244

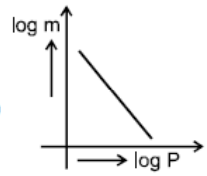
33. H_2O_2 solution used for hair bleaching is sold as a solution of approximately 5.0 g H_2O_2 per 100 mL of the solution. The molecular weight of H_2O_2 is 34. The molarity of this solution is approximately-
(A) 3.0 (B) 1.5 (C) 0.15 (D) 4.0

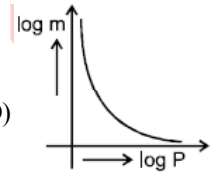
34. 10 gram of glucose are dissolved in 150 gram of water. The mass % of glucose is-
(A) 5% (B) 6.25%
(C) 93.75% (D) 15%

35. Which of the following curves represents the Henry's law ?

(A) 

(B) 

(C) 

(D) 

36. At a given temperature, total vapour pressure in Torr of a mixture of volatile components A and B is given by $P_{Total} = 120 + 75\ X_B$ hence, vapour pressure of pure A and B respectively (in Torr) are
(A) 120, 75 (B) 120, 195
(C) 120, 45 (D) 75, 45

37. A solution of sulphuric acid in water exhibits -
(A) Negative deviations from Raoult's law
(B) Positive deviations from Raoult's law
(C) Ideal properties
(D) The applicability of Henry's law

38. Which one of the following salts would have the same value of the Vant Hoff factor (i) as that of $K_3[Fe(CN)_6]$.
(A) NaCl (B) Na_2SO_4
(C) $Al_2(SO_4)_3$ (D) $Al(NO_3)_3$

39. The passing of solvent particles through semipermeable membrane is called-
(A) Osmosis (B) Electrodialysis
(C) Electrophoresis (D) Electroplating

40. Two solutions have different osmotic pressures. The solution of higher osmotic pressure is called-
(A) Isotonic solution (B) Hypotonic solution
(C) Isotopic solution (D) Hypertonic solution

41. The density of a solution containing 13% by mass of sulphuric acid is 1.09 g/mL. Calculate the molarity of the solution-
(A) 1.445 M (B) 14.45 M
(C) 144.5 M (D) 0.1445 M

42. Suppose 5 g of CH_3COOH is dissolved in one litre of Ethanol. Assume no reaction between them. Calculate molality of resulting solution if density of Ethanol is 0.789 g/mL.
(A) 0.0856 (B) 0.0956 (C) 0.1056 (D) 0.1156

43. Calculate the molarity and normality of a solution containing 0.5 gm of NaOH dissolved in 500 mL solution.
(A) 0.0025 M, 0.025 N (B) 0.025 M, 0.025 N
(C) 0.25 M, 0.25 N (D) 0.025 M, 0.0025 N

44. A solution has 25% of water, 25% ethanol and 50% acetic acid by mass. Calculate the mole fraction of each component.
(A) 0.50, 0.3, 0.19 (B) 0.19, 0.3, 0.50
(C) 0.3, 0.19, 0.50 (D) 0.50, 0.19, 0.3

45. In what ratio should a 6.5 N HNO_3 be diluted with water to get 3.5 N HNO_3 ?
(A) 6 : 7 (B) 7 : 6 (C) 5 : 6 (D) 6 : 5

46. Calculate the amount of each in the following solutions -

(i) 150 mL of $\frac{N}{7}$ H_2SO_4

(ii) 250 mL of 0.2M $NaHCO_3$

(iii) 400 mL of $\frac{N}{10}$ Na_2CO_3

(iv) 1052 g of 1 m KOH.
(A) 52 g, 2.12 g, 4.2 g, 1.05 g
(B) 1.05 g, 4.2 g, 2.12 g, 52 g
(C) 1.05 g, 2.12 g, 52 g, 4.2 g
(D) 4.2 g, 2.12 g, 1.05 g, 52 g

47. Blood plasma has the following composition (milliequivalents per litre). Calculate its osmotic pressure at 370C.

$Na^+ = 138$, $Ca^{2+} = 5.2$, $K^+ = 4.5$, $Mg^{2+} = 2.0$, $Cl^- = 105$, $HCO_3^- = 25$, $PO_4^{3-} = 2.2$, $SO_4^{2-} = 0.5$,
Proteins = 16, Others = 1.0

(A) 7.47 atm (B) 7.30 atm
(C) 7.29 atm (D) 7.40 atm

48. A solution of 0.450 g of urea (mol. wt. 60) in 22.5 g of water showed 0.170°C of elevation in boiling point. Calculate the molal elevation constant of water-

(A) 0.17ºC (B) 0.45ºC (C) 0.51ºC (D) 0.30ºC

49. The freezing point of 0.2 molal K_2SO_4 is –1.1°C. Calculate Van't Hoff factor and percentage degree of dissociation of K_2SO_4. K_f for water is 1.86°C

(A) 97.5 (B) 90.75 (C) 105.5 (D) 85.75

50. The volumes of two HCl solutions *A* (0.5 *N*) and B (0.1 *N*) to be mixed for preparing 2 L of 0.2 N HCl are -

(A) 0.5 L of A + 1.5 L of B
(B) 1.5 L of A + 0.5 L of B
(C) 1 L of A + 1 L of B
(D) 0.75 L of A + 1.25 L of B

SECTION-B

51. The vapour pressure of an aqueous solution of $CaCl_2$ at 25°C is 20 mm Hg. The vapour pressure of pure water at the same temperature is 21.08 mm Hg. Find freezing point depression (ΔT_f) of solution.

[Given : $K_f = 2$ K kg mol^{-1}]

52. Normal freezing point of a solvent is 150,,aC. A 0.5 molal solution of urea in the above solvent causes a freezing point depression of two degrees. Calculate the molal depression constant

53. The osmotic pressure of 0.5 M monobasic acid solution is 0.6 RT at T Kelvin. What is its pH value?

54. Calculate vapour pressure of solution obtained by mixing 0.2 mol of NaCl in 72g of water at 25°C.
[**Given :** vapour pressure of water at 25°C is 24.2 torr]
[Divide your answer by 11]

55. A 0.4 M formic acid (HCOOH) solution freezes at –0.93°C. Then Ka of that acid is :
[**Given :** K_f for water = 1.86 K - kg / mole]
[Write your answer by multiplying with 30]

56. The freezing point of 0.1 molal aq. solution of $K_X[Fe(CN)_6]$ is – 0.93°C. The molal depression constant of water is 1.86 K-Kg mol^{-1} . If the salt behaves as strong electrolyte in water then calculate the value of 'X'

57. 15 g of methyl alcohol is dissolved in 35 g of water. What is the mass percentage of methyl alcohol in solution ?

58. 0.15 g of a substance dissolved in 15 g of solvent boiled at a temperature higher by 0.216oC than that of the pure solvent. Calculate the molecular weight of the substance. Molal elevation constant for the solvent is 2.16oC.

59. The volume of water which must be added to a mixture of 350 cm^3 of 6 M HCl and 650 mL of 3 M HCl to get a resulting solution of 3 M concentration is

60. 250 mL of a Na_2CO_3 solution contains 2.65 g of Na_2CO_3. 10 mL of this solution is added to *x* mL of water to obtain 0.001 M Na_2CO_3 solution. The value of *x* is :
(Molecular mass of Na_2CO_3 = 106 amu)-

61. If $A^{-1} = \begin{bmatrix} 2 & 3 & 1 \\ -1 & 2 & 1 \\ 0 & 1 & 4 \end{bmatrix}$ then which of the following is incorrect ?

(A) $\text{Adj}(A) = \frac{1}{25}\begin{bmatrix} 2 & 3 & 1 \\ -1 & 2 & 1 \\ 0 & 1 & 4 \end{bmatrix}$

(B) $|\text{Adj}(\text{AdjA})| = 5^8$

(C) $|5\text{Adj}(\text{AdjA})| = 5^{-5}$

(D) $|\text{Adj}(A^{-1})| = 5^4$

62. Value of $\begin{vmatrix} 2bc-a^2 & c^2 & b^2 \\ c^2 & 2ac-b^2 & a^2 \\ b^2 & a^2 & 2ab-c^2 \end{vmatrix}$ is

(A) Always +ive

(B) always –ive

(C) zero only when a = b = c

(D) Always greater than or equal to zero

63. Which one of the following pair of functions are identical ?

(A) $e^{(\ell nx)/2}$ and $\sqrt{x}$

(B) $\tan^{-1}(\tan x)$ and $\cot^{-1}(\cot x)$

(C) $\cos^2 x + \sin^4 x$ and $\sin^2 x + \cos^4 x$

(D) $\frac{|x|}{x}$ and sgn (x), where sgn(x) stands for signum function.

64. If $A = \begin{bmatrix} 0 & \alpha & \alpha \\ 2\beta & \beta & -\beta \\ \gamma & -\gamma & \gamma \end{bmatrix}$ is an orthogonal matrix, then the number of possible triplets (α, β, γ)

(A) 8 (B) 6 (C) 4 (D) 2

65. If M is square matrix such that $M^2 = M$, then $(I + M)^3 - 7M$ is equal to

(A) M (B) I – M (C) I (D) 3M

66. If the function f, g, h are defined from the sets of real numbers $R \to R$ such that $f(x) = x^2 - 1$, $g(x) = \sqrt{x^2+1}$, $h(x) = \begin{cases} 0, & \text{if } x \le 0 \\ x, & \text{if } x \ge 0 \end{cases}$, then the composite function hofog(x) is

(A) $\begin{cases} 0, & x = 0 \\ x^2, & x > 0 \\ -x^2, & x < 0 \end{cases}$ (B) $\begin{cases} 0, & x = 0 \\ x^2, & x \ne 0 \end{cases}$

(C) $\begin{cases} 0, & x \le 0 \\ x^2, & x \ge 0 \end{cases}$ (D) $\begin{cases} x^2, & x \le 0 \\ -x^2, & x > 0 \end{cases}$

67. If $\theta_1 = \sin^{-1}\left(\frac{4}{5}\right) + \sin^{-1}\left(\frac{1}{3}\right)$ and $\theta_2 = \cos^{-1}\frac{4}{5} + \cos^{-1}\frac{1}{3}$ then

(A) $\theta_1 < \theta_2$ (B) $\theta_1 > \theta_2$

(C) $\theta_1 = \theta_2$ (D) $\theta_1 - 2\theta_2$

68. If $x \ge 0$ and $\theta = \sin^{-1}x + \cos^{-1}x - \tan^{-1}x$, then

(A) $\frac{\pi}{2} \le \theta \le \frac{3\pi}{4}$ (B) $0 \le \theta \le \frac{\pi}{4}$

(C) $0 \le \theta < \frac{\pi}{2}$ (D) $\frac{\pi}{4} \le \theta \le \frac{\pi}{2}$

69. Let A = {1, 2, 3, ... , 45} and R be the relation ' is square of element ' on A. Which of the following is false?

(A) R = {(1, 1), (4, 2), (9, 3), (16, 4), (25, 5), (36, 6)}

(B) Domain of R = (1, 4, 9, 16, 25, 36)

(C) Range of R = {1, 2, 3, 4, 5, 6}

(D) Range of R = {3, 4, 5, 6}

70. The value of $\cos^{-1}\left(-\sin\frac{7\pi}{6}\right)$ is-

(A) $\frac{5\pi}{3}$ (B) $\frac{7\pi}{6}$

(C) $\frac{\pi}{3}$ (D) None of these

71. The value of $\cot^{-1}\left\{\frac{\sqrt{1-\sin x}+\sqrt{1+\sin x}}{\sqrt{1-\sin x}-\sqrt{1+\sin x}}\right\}$, $\frac{\pi}{2} < x < \pi$, is:

(A) $\pi - \frac{x}{2}$ (B) $\frac{\pi}{2} + \frac{x}{2}$

(C) $\frac{x}{2}$ (D) $2\pi - \frac{x}{2}$

72. The number of solutions of the equation $\tan^{-1}(4\{x\}) + \cot^{-1}(x + [x])) = \frac{\pi}{2}$, is (where [.] denotes greatest integer function and {.} fractional part function)

(A) 2 (B) 3 (C) 1 (D) 4

73. Let R be the relation on N defined as xRy iff x + 2y = 8. The domain of R is

(A) {2, 4, 8} (B) {2, 4, 6, 8}

(C) {2, 4, 6} (D) {1, 2, 3, 4}

74. If the range of the function f(x) = sgn(sinx) + sgn(cosx) + sgn(tanx) + sgn(cotx) where $x \neq \frac{n\pi}{2}$, (n $\in$ I) is {a, b, c} then

(A) $|a+b+c| = 6$ (B) $|a+b+c| = 1$

(C) $|a+b+c| = 2$ (D) $|a+b+c| = 4$

75. If $A^3 = \begin{bmatrix} 8 & -57 \\ 0 & 27 \end{bmatrix}$, where A is an upper triangular matrix with real entries, then det $(5A - A^2)$ is equal to

(A) 6 (B) –6 (C) –36 (D) 36

76. Which of the following relation is a function ?

(A) {(1, 4), (2,6), (1,5), (3, 9)}

(B) {(3, 3), (2,1), (1,2), (2, 3)}

(C) {(1, 2), (2,2), (3,2), (4, 2)}

(D) {(3, 1), (3,2), (3,3), (3, 4)}

77. If x, y, z are different and $D = \begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix}$ and $(\Delta = 0)$ then xyz is equal to

(A) 1 (B) 0 (C) –2 (D) –1

78. For 3 × 3 matrices A and B, which of following statement is incorrect ?

(A) AB – BA is skew symmetric for all symmetric matrices A and B

(B) adj(AB) = (adj B)(adj A) for all invertible matrices A and B

(C) AB is symmetric for all symmetric matrices A and B

(D) B^TAB is symmetric or skew symmetric, according as A is symmetric or skew symmetric

79. If $a\,f(x+1) + bf\left(\frac{1}{x+1}\right) = x, x \neq -1, a \neq b$, then f(2) is equal to :

(A) $\frac{2a+b}{2(a^2-b^2)}$ (B) $\frac{a}{a^2-b^2}$

(C) $\frac{a+2b}{a^2-b^2}$ (D) $\frac{2b}{a^2-b^2}$

80. Let S be the set of all real numbers. Then the relation R = {(a, b) : 1 + ab > 0} on S is

(A) An equivalence relations

(B) Reflexive but not symmetric

(C) Reflexive and transitive

(D) Reflexive and symmetric but not transitive

SECTION-B

81. Let λ and α be real. If S = [a, b] denote the set of all values of λ for which the system of linear equations

$\lambda x + (\sin\alpha)y + (\cos\alpha)z = 0$

$x + (\cos\alpha)y + (\sin\alpha)z = 0$

$-x + (\sin\alpha)y - (\cos\alpha)z = 0$

has a non-trivial solution, then a + b + 1 is

82. Find the number of integral values of x in the domain of $f(x) = \sin^{-1}[2 - 4x^2]$ (where [.] is greatest integer function}.

83. If $0 < \theta < 90$ and $\theta = \tan^{-1}(2\tan^2\theta) - \tan^{-1}\left(\frac{1}{3}\tan\theta\right)$, then $3\tan\theta$ is equal to

84. Let $f(x) = -4.\sqrt{e^{1-x}} + 1 + x + \frac{x^2}{2} + \frac{x^3}{3}$. If g(x) is inverse of f(x), then the value of $\frac{1}{g'\left(-\frac{7}{6}\right)}$ is

85. Let $f(x) = \sqrt{-x^2 - 2x + n}$. If there are atleast 5 positive integer in the domain of f(x) then minimum value of $\frac{n}{5}$ is

86. Number of integers in domain of $f(x) = \log\left(\tan^{-1}\left(\frac{x^3 - 6x^2 + 11x - 6}{x(e^x - 1)}\right)\right) + \sqrt{10 - x}$ are

87. If f(x) is an odd periodic function defined on R with period = 2 then f(6) + f(3) + f(–3) + f(8) equals to

88. If $\left(\tan^{-1}\frac{y}{15}\right)^2 + \left(\cot^{-1}\frac{y}{15}\right)^2 = \frac{5\pi^2}{8}$, then |y| =

89. If $\sum_{\alpha=1}^{\infty} \operatorname{cosec}^{-1}\sqrt{1+4\alpha^4} = \frac{a\pi}{b}$ (where a, b are coprime number) then (a + b) is equal to

90. Let A = {1, 2}, B = {0} then number of possible relations from A to B is