

MANAS JEE TEST SERIES -2

INSTRUCTIONS

1. This test will be a 3 hour Test.
2. This test consists of Physics, Chemistry and Mathematics questions with equal weightage of 100 marks.
3. Each question is of 4 marks.
4. There are three sections in the question paper consisting of Physics (Q.no.1 to 25), Chemistry (Q.no.26 to 50) and Mathematics (Q. no.51 to 75). Each section is divided into two parts, Part I consists of 20 multiple choice questions & Part II consists of 5 Numerical value type Questions.
5. There will be only one correct choice in the given four choices in Part I. For each question 4 marks will be awarded for correct choice, 1 mark will be deducted for incorrect choice for Part I Questions and zero mark will be awarded for not attempted question. For Part II Questions 4 marks will be awarded for correct answer and zero for unattempted and incorrect answer.
6. Any textual, printed or written material, mobile phones, calculator etc. is not allowed for the students appearing for the test.
7. All calculations/written work should be done in the rough sheet provided.

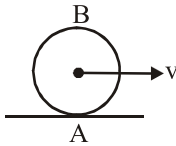
PHYSICS

PART-I (Multiple Choice Questions)

1. A bus is moving with a velocity of 10m/s on a straight road. A scooterist wishes to overtake the bus in 100 seconds. If the bus is at a distance of 1 km from the scooterist, at what velocity should the scooterist chase the bus?
(a) 50 m/sec (b) 40 m/sec
(c) 30 m/sec (d) 20 m/sec
2. The length of an elastic string is x when the tension is 5N. Its length is y when the tension is 7N. What will be its length, when the tension is 9N?
(a) $2y+x$ (b) $2y-x$
(c) $7x-5y$ (d) $7x+5y$
3. A rod of length L is placed on x -axis between $x=0$ and $x=L$. The linear density i.e., mass per unit length denoted by ρ , of this rod, varies as, $\rho = a + bx$. What should be the dimensions of b ?
(a) $M^2L^1T^0$
(b) $M^1L^{-2}T^0$
(c) $M^{-1}L^3T^1$
(d) $M^{-1}L^2T^3$

Space for Rough Work

4. A wheel is rolling on a plane road. The linear velocity of centre of mass is v . Then velocities of the points A and B on circumference of wheel relative to road will be

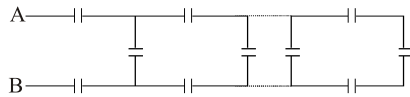


- (a) $v_A = v, v_B = 0$
 (b) $v_A = v_B = 0$
 (c) $v_A = 0, v_B = v$
 (d) $v_A = 0, v_B = 2v$
5. A metallic wire of density d is lying horizontal on the surface of water. The maximum length of wire so that it may not sink will be

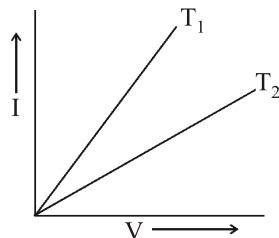
- (a) $\sqrt{\frac{2Tg}{\pi d}}$ (b) $\sqrt{\frac{2\pi T}{dg}}$
 (c) $\sqrt{\frac{2T}{\pi dg}}$ (d) any length

6. Two points of a rod move with velocities $3v$ and v perpendicular to the rod and in the same direction, separated by a distance r . Then the angular velocity of the rod is
 (a) $3v/r$ (b) $4v/r$
 (c) $5v/r$ (d) $2v/r$
7. For hydrogen gas $C_p - C_v = a$ and for oxygen gas $C_p - C_v = b$. So, the relation between a and b is given by
 (a) $a = 16b$ (b) $16a = b$
 (c) $a = 4b$ (d) $a = b$

8. A bucket full of hot water is kept in a room and it cools from 75°C to 70°C in T_1 minutes, from 70°C to 65°C in T_2 minutes and from 65°C to 60°C in T_3 minutes. Then
 (a) $T_1 = T_2 = T_3$
 (b) $T_1 < T_2 < T_3$
 (c) $T_1 > T_2 > T_3$
 (d) $T_1 < T_3 < T_2$
9. The equivalent capacity of the network, (with all capacitors having the same capacitance C)

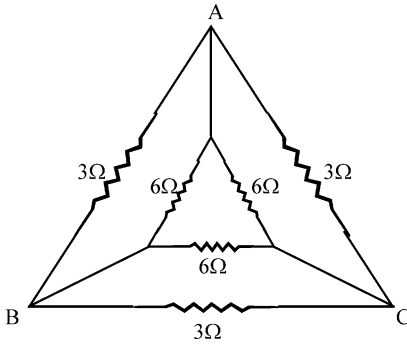


- (a) ∞
 (b) zero
 (c) $C[(\sqrt{3}-1)/2]$
 (d) $C[(\sqrt{3}+1)/2]$
10. The current I vs voltage V graphs for a given metallic wire at two different temperatures T_1 and T_2 are shown in the figure. It is concluded that

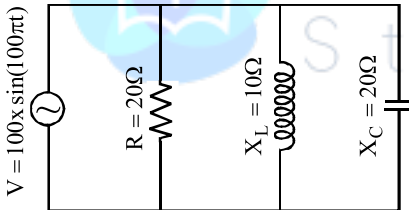


- (a) $T_1 > T_2$ (b) $T_1 < T_2$
 (c) $T_1 = T_2$ (d) $T_1 = 2T_2$

11. In the circuit shown the effective resistance between B and C is

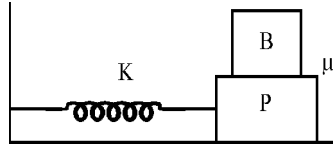


- (a) 3Ω (b) 4Ω
 (c) $4/3\Omega$ (d) $3/4\Omega$
12. In the given circuit, the current drawn from the source is



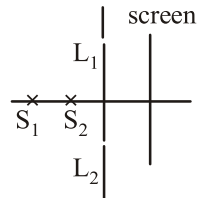
- (a) 20 A (b) 10 A
 (c) 5 A (d) $5\sqrt{2}$ A
13. A flat plate P of mass 'M' executes SHM in a horizontal plane by sliding over a frictionless surface with a frequency ν . A block 'B' of mass 'm' rests on the plate as shown in figure. Coefficient of

friction between the surface of B and P is μ . What is the maximum amplitude of oscillation that the plate block system can have if the block B is not to slip on the plate :

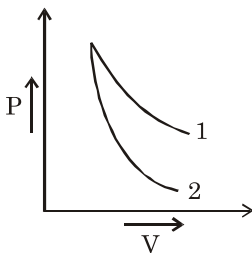


- (a) $\frac{\mu g}{4\pi^2 \nu^2}$ (b) $\frac{\mu g}{4\pi^2 \nu}$
 (c) $\frac{\mu}{4\pi^2 \nu^2 g}$ (d) $\frac{\mu g}{2\pi^2 \nu^2}$
14. A glass slab has the left half of refractive index n_1 , and the right half of $n_2 = 3n_1$. The effective refractive index of the whole slab is

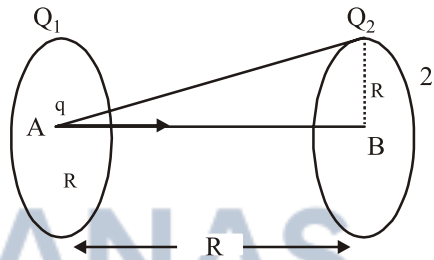
- (a) $\frac{n_1}{2}$ (b) $2n$
 (c) $\frac{3n_1}{2}$ (d) $\frac{2n_1}{3}$
15. In the arrangement shown L_1, L_2 are slits and S_1, S_2 two independent sources on the screen, interference fringes



- (a) will not be there
 (b) will not be there if the intensity of light reaching the screen from S_1 and S_2 are equal.
 (c) will be there under all circumstances
 (d) we will have only the central fringe
16. What is the ratio of the circumference of the first Bohr orbit for the electron in the hydrogen atom to the de Broglie wavelength of electrons having the same velocity as the electron in the first Bohr orbit of the hydrogen atom?
 (a) 1 : 1 (b) 1 : 2
 (c) 1 : 4 (d) 2 : 1
17. The radioactivity of a sample is R_1 at a time T_1 and R_2 at a time T_2 . If the half life of the specimen is T , the number of atoms that have disintegrated in the time $(T_2 - T_1)$ is proportional to
 (a) $(R_1 T_1 - R_2 T_2)$
 (b) $(R_1 - R_2)$
 (c) $(R_1 - R_2)/T$
 (d) $(R_1 - R_2) \times T$
18. P-V plots for two gases during adiabatic processes are shown in the figure. Plots 1 and 2 should correspond respectively to



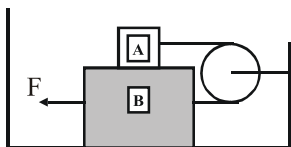
- (a) He and Ar (b) He and O_2
 (c) O_2 and N_2 (d) O_2 and He
19. Two identical thin rings, each of radius R metres, are coaxially placed at a distance R metres apart. If Q_1 coulomb and Q_2 coulomb are respectively, the charges uniformly spread on the two rings, the work done in moving a charge q from the centre of one ring to that of the other is



- (a) zero
 (b) $q(Q_1 - Q_2) (\sqrt{2} - 1) / \sqrt{2} 4\pi\epsilon_0 R$
 (c) $q\sqrt{2} (Q_1 + Q_2) / 4\pi\epsilon_0 R$
 (d) $q(Q_1 + Q_2) (\sqrt{2} + 1) / \sqrt{2} 4\pi\epsilon_0 R$
20. The ratio of the coefficient of volume expansion of a glass container to that of a viscous liquid kept inside the container is 1 : 4. What fraction of the inner volume of the container should the liquid occupy so that the volume of the remaining vacant space will be same at all temperatures?
 (a) 2 : 5 (b) 1 : 4
 (c) 1 : 64 (d) 1 : 8

PART-II (Numerical Answer Questions)

21. The masses of the blocks A and B are 0.5 kg and 1 kg respectively. These are arranged as shown in the figure and are connected by a massless string. The coefficient of friction between all contact surfaces is 0.4. The force (in N) necessary to move the block B with constant velocity will be ($g = 10\text{m/s}^2$)

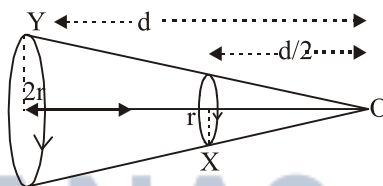


22. A body is thrown vertically upwards from the surface of earth in such a way that it reaches upto a height equal to $10R_e$. The velocity (in km/s) imparted to the body will be
23. A non-conducting partition divides a container into two equal compartments. One is filled with helium gas at 200 K and the other is filled with oxygen gas at 400 K. The number of molecules in each gas is the same. If the partition is removed to allow the gases to mix, the final temperature (in K) will be
24. A transformer is used to light a 140 W, 24 V bulb from a 240 V a.c. mains. The current in the main cable is 0.7 A. The efficiency (in %) of the transformer is

25. Two circular coils X and Y, having equal number of turns, carry equal currents in the same sense and subtend same solid angle at point O. If the smaller coil X is midway between O and Y, then if we represent the magnetic induction due to bigger coil Y at O as B_Y and due to smaller

coil X at O as B_X then the ratio $\frac{B_Y}{B_X}$

is


CHEMISTRY
PART-I (Multiple Choice Questions)

26. Which of the following structures does not contain any chiral C atom but represent the chirality in the structure.
- (a) 2-Ethyl-3-hexene
 (b) 2,3-Pentadiene
 (c) 1,3-Butadiene
 (d) Pent-3-en-1-yne
27. The root mean square speed of gas molecules at 25K & $1.5 \times 10^5 \text{ Nm}^{-2}$ is 100.5 ms^{-1} . If the temperature is raised to 100K & pressure to $6.0 \times 10^5 \text{ Nm}^{-2}$, the root mean square speed becomes.
- (a) 100.5 ms^{-1} (b) 201.0 ms^{-1}
 (c) 402 ms^{-1} (d) 1608 ms^{-1}

Space for Rough Work

28. Reduction with aluminium isopropoxide in excess of isopropyl alcohol is called Meerwein-Ponndorff-Verley reduction (MPV). What will be the final product when cyclohex-2-enone is selectively reduced in MPV reaction?
- (a) Cyclohexanol
 (b) Cyclohex-2-enol
 (c) Cyclohexanone
 (d) Benzene
29. N_2 and O_2 are converted to mono cations N_2^+ and O_2^+ respectively, which of the following is wrong?
- (a) In N_2^+ , the N - N bond weakens
 (b) In O_2^+ , the O - O bond order increases
 (c) In O_2^+ , paramagnetism decreases
 (d) N_2^+ becomes diamagnetic
30. The reaction in which hydrogen peroxide acts as a reducing agent is
- (a) $PbS + 4H_2O_2 \rightarrow PbSO_4 + 4H_2O$
 (b) $2KI + H_2O_2 \rightarrow 2KOH + I_2$
 (c) $2FeSO_4 + H_2SO_4 + H_2O_2 \rightarrow Fe_2(SO_4)_3 + 2H_2O$
 (d) $Ag_2O + H_2O_2 \longrightarrow 2Ag + H_2O + O_2$
31. Reaction of $\begin{array}{c} CH_2 - CH_2 \\ \diagdown \quad / \\ O \end{array}$ with $RMgX$ leads to formation of
- (a) $RCHOHR$
 (b) $RCHOHCH_3$
 (c) RCH_2CH_2OH
 (d) $\begin{array}{c} R \\ \diagdown \\ CHCH_2OH \\ / \\ R \end{array}$
32. Which reaction will not yield an amide?
- (a) $C_2H_5 - \overset{O}{\parallel} C - Cl + NH_3$
 (b) $C_2H_5 - \overset{O}{\parallel} C - O - \overset{O}{\parallel} C - Cl + CH_3NH_2$
 (c) $CH_3 - \overset{O}{\parallel} C - Cl + (CH_3)_3N$
 (d) $CH_3 - \overset{O}{\parallel} C - O - \overset{O}{\parallel} C - CH_3 + CH_3NH - CH_2 - CH_3$
33. How many different dipeptides can be formed by two different amino acids?
- (a) 4 (b) 1
 (c) 3 (d) 2
34. When tert-butyl chloride is made to react with sodium methoxide, the major product is
- (a) dimethyl ether
 (b) di-tert-butyl ether
 (c) tert-butylmethyl ether
 (d) isobutylene

35. If s_0, s_1, s_2 and s_3 are the solubilities of AgCl in water, 0.01 M CaCl_2 , 0.01 M NaCl and 0.05 M AgNO_3 solutions, respectively, then
- $s_0 > s_1 > s_2 > s_3$
 - $s_0 > s_2 > s_1 > s_3$
 - $s_0 > s_2 > s_3 > s_1$
 - $s_0 > s_1 = s_2 > s_3$
36. An organic compound is treated with NaNO_2 and dil. HCl at 0°C . The resulting solution is added to an alkaline solution of β -naphthol where by a brilliant red dye is produced. It shows the presence of
- $-\text{NO}_2$ group
 - aromatic $-\text{NH}_2$ group
 - $-\text{CONH}_2$ group
 - aliphatic $-\text{NH}_2$ group
37. Point out the incorrect statement among the following :
- The oxidation state of oxygen is +2 in OF_2 .
 - Acidic character follows the order $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$.
 - The tendency to form multiple bonds increases in moving down the group from sulphur to tellurium (towards C and N)
 - Sulphur has a strong tendency to catenate while oxygen shows this tendency to a limited extent.
38. Removal of Fe, Cu, W from Sn metal after smelting is by because
- Poling; of more affinity towards oxygen for impurities
 - Selective oxidation; of more affinity towards oxygen for impurities
 - Electrolytic refining; impurities undissolved in electrolyte
 - Liquation; Sn having low melting point compared to impurities.
39. Among $\text{KO}_2, \text{AlO}_2^-, \text{BaO}_2$ and NO_2^+ , unpaired electron is present in
- NO_2^+ and BaO_2
 - KO_2 and AlO_2^-
 - KO_2 only
 - BaO_2 only
40. If a 0.1 M solution of glucose (Mol. wt 180) and 0.1 molar solution of urea (Mol. wt. 60) are placed on two sided semipermeable membrane to equal heights, then it will be correct to say that
- there will be no net movement across the membrane
 - glucose will flow across the membrane into urea solution
 - urea will flow across the membrane into glucose solution
 - water will flow from urea solution to glucose solution

41. When pink $[\text{Co}(\text{H}_2\text{O})_6]^{2\oplus}$ is dehydrated the colour changes to blue. The correct explanation for the change is :
- The octahedral complex becomes square planar.
 - A tetrahedral complex is formed.
 - Distorted octahedral structure is obtained.
 - Dehydration results in the formation of polymeric species.
42. Amongst the following the compound that is both paramagnetic and coloured is
- $\text{K}_2\text{Cr}_2\text{O}_7$
 - $(\text{NH}_4)_2[\text{TiCl}_6]$
 - CoSO_4
 - $\text{K}_3[\text{Cu}(\text{CN})_4]$
43. A reaction rate constant is given by $K = 1.2 \times 10^{10} e^{-2500/RT}$. It means
- $\log K$ vs T will give a straight line
 - $\log K$ vs $1/T$ gives a straight line with a slope $-2500/2.303 R$
 - half life of reaction will be more at higher temperature
 - $\log K$ vs $1/T$ gives a straight line with a slope $2500/R$
44. The correct statement among the following is :
- The alkali metals when strongly heated in oxygen form superoxides.
 - Caesium is used in photoelectric cells.
 - NaHCO_3 is more soluble in water than KHCO_3 .
 - The size of hydrated ions of alkali metals increases from top to bottom.
45. The e.m.f. of a Daniell cell, $\text{Zn} \left| \text{ZnSO}_4 \right. \left. \left| \text{CuSO}_4 \right| \text{Cu} \right.$, at 298 K $\left(\begin{array}{l} (0.01\text{M}) \\ (1.0\text{M}) \end{array} \right)$ is E_1 . When the concentration of ZnSO_4 is 1.0 M and that of CuSO_4 is 0.01 M, the e.m.f. changed to E_2 . What is the relationship between E_1 and E_2 ?
- $E_1 < E_2$
 - $E_1 = E_2$
 - $E_2 = 0 \neq E_1$
 - $E_1 > E_2$

PART-II (Numerical Answer Questions)

46. The vapour pressure of benzene at a certain temperature is 640 mm of Hg. A non volatile and non electrolyte solid weighing 2.175 g is added to 39.08 g of benzene. If the vapour pressure of the solution is 600mm of Hg, what is the molecular weight of solid substance?
47. What will be the uncertainty in the position of an electron (mass $9.1 \times 10^{-28}\text{g}$) moving with a velocity of $3.0 \times 10^4 \text{ cm s}^{-1}$ accurate up to 0.011%
48. When CO_2 dissolves in water, the following equilibrium is established $\text{CO}_2 + 2\text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{HCO}_3^-$; for which the equilibrium constant is 3.8×10^{-6} and $\text{pH} = 6.0$. What would be the ratio of concentration of bicarbonate ion to carbon dioxide?

49. The wave number of first line of Balmer series of hydrogen is 15200 cm^{-1} . What will be the wave number of first Balmer line of Li^{2+} ion?
50. A cylinder of gas supplied by Bharat Petroleum is assumed to contain 14 kg of butane. If a normal family requires 20,000 kJ of energy per day for cooking, butane gas in the cylinder last for Days.
 $(\Delta H_c \text{ of } \text{C}_4\text{H}_{10} = -2658 \text{ JK per mole})$
53. If $0 < \alpha, \beta, \gamma < \pi/2$ such that $\alpha + \beta + \gamma = \frac{\pi}{2}$ and $\cot \alpha, \cot \beta, \cot \gamma$ are in arithmetic progression, then the value of $\cot \alpha \cot \gamma$ is
 (a) 1 (b) 3
 (c) $\cot^2 \beta$ (d) $\cot \alpha + \cot \gamma$
54. If $\omega = \cos \frac{\pi}{n} + i \sin \frac{\pi}{n}$, then value of $1 + \omega + \omega^2 + \dots + \omega^{n-1}$ is
 (a) $1 + i$
 (b) $1 + i \tan(\pi/n)$
 (c) $1 + i \cot(\pi/2n)$
 (d) None of these

MATHEMATICS

PART-I (Multiple Choice Questions)

51. If a, b, c, d and p are distinct non zero real numbers such that $(a^2 + b^2 + c^2) p^2 - 2(ab + bc + cd)p + (b^2 + c^2 + d^2) \leq 0$ then a, b, c, d are in
 (a) A.P.
 (b) G.P.
 (c) H.P.
 (d) satisfy $ab = cd$
52. Which of the following is correct?
 (a) If $a^2 + 4b^2 = 12ab$, then

$$\log(a + 2b) = \frac{1}{2}(\log a + \log b)$$

 (b) If $\frac{\log x}{b-c} = \frac{\log y}{c-a} = \frac{\log z}{a-b}$,
 then $x^a \cdot y^b \cdot z^c = abc$
 (c)

$$\frac{1}{\log_{xy} xyz} + \frac{1}{\log_{yz} xyz} + \frac{1}{\log_{zx} xyz} = 2$$

 (d) All are correct
55. The circles $x^2 + y^2 - 2x - 15 = 0$ and $x^2 + y^2 + 4y + 3 = 0$ have
 (a) no common tangent
 (b) one common tangent
 (c) three common tangents
 (d) four common tangents
56. Which of the following is correct?
 (a) If A and B are square matrices of order 3 such that $|A| = -1, |B| = 3$, then the determinant of $3AB$ is equal to 27.
 (b) If A is an invertible matrix, then $\det(A^{-1})$ is equal to $\det(A)$
 (c) If A and B are matrices of the same order, then $(A+B)^2 = A^2 + 2AB + B^2$ is possible if $AB = I$
 (d) None of these
57. If the solution of the linear equations $x - 2y + z = 0$; $2x - y + 3z = 0$ and $\lambda x + y - z = 0$ is

- trivial then the value of λ is given by
- (a) $\lambda = -\frac{4}{5}$ (b) $\lambda \neq -\frac{4}{5}$
 (c) $\lambda = 2$ (d) $\lambda \neq 2$
58. Let $f(x) = |x - 1|$. Then
 (a) $f(x^2) = (f(x))^2$
 (b) $f(x+y) = f(x) + f(y)$
 (c) $f(|x|) = |f(x)|$
 (d) None of these
59. If

$$\sin^{-1} \frac{2a}{1+a^2} + \sin^{-1} \frac{2b}{1+b^2} = 2 \tan^{-1} x,$$
 then x is equal to
 (a) $\frac{a-b}{1+ab}$ (b) $\frac{b}{1+ab}$
 (c) $\frac{b}{1-ab}$ (d) $\frac{a+b}{1-ab}$
60. If $AB = 0$, then for the matrices

$$A = \begin{bmatrix} \cos^2 \theta & \cos \theta \sin \theta \\ \cos \theta \sin \theta & \sin^2 \theta \end{bmatrix}$$
 and $B = \begin{bmatrix} \cos^2 \phi & \cos \phi \sin \phi \\ \cos \phi \sin \phi & \sin^2 \phi \end{bmatrix},$
 $\theta - \phi$ is
 (a) an odd number of $\frac{\pi}{2}$
 (b) an odd multiple of π
 (c) an even multiple of $\frac{\pi}{2}$
 (d) 0
61. The set of points where $f(x) = (x - 1)^2 (x + |x - 1|)$ is thrice differentiable, is
 (a) \mathbb{R} (b) $\mathbb{R} - \{0\}$
 (c) $\mathbb{R} - \{1\}$ (d) $\mathbb{R} - \{0, 1\}$
62. Let $f(x) = 1/(x - 1)$ and $g(x) = 1/(x^2 + x - 2)$. Then the set of points where $(g \circ f)(x)$ is discontinuous, is
 (a) $\{1\}$ (b) $\{-2, 1\}$
 (c) $\{1/2, 1, 2\}$ (d) $\{1/2, 1\}$
63. $\sum_{r=0}^m {}^{n+r}C_r$ is equal to :
 (a) ${}^{n+m+1}C_{n+1}$
 (b) ${}^{n+m+2}C_n$
 (c) ${}^{n+m+3}C_{n-1}$
 (d) None of these
64. Let $f(x) = \frac{x - \{x+1\}}{x - \{x+2\}}$; where $\{x\}$ is the fractional part of x , then

$$\lim_{x \rightarrow 1/3} f(x)$$
 (a) has value 0
 (b) has value 1
 (c) has value $-\infty$
 (d) has value ∞
65. The order of the differential equation

$$\left[1 + 5 \left(\frac{dy}{dx} \right)^2 \right]^{3/2} = 11 \left(\frac{d^2y}{dx^2} \right)^5$$
 is
 (a) 1 (b) 2
 (c) 3 (d) 4

66. The value of

$$\int_{-\pi/4}^{\pi/4} (x|x| + \sin^3 x + x \tan^2 x + 1) dx \text{ is}$$

- (a) 0 (b) 1
 (c) $\pi/4$ (d) $\pi/2$

67. Let $(1-x-2x^2)^6 = 1 + a_1x + a_2x^2 + \dots + a_{12}x^{12}$. Then

$$\frac{a_2}{2^2} + \frac{a_4}{2^4} + \frac{a_6}{2^6} + \dots + \frac{a_{12}}{2^{12}} \text{ is}$$

equal to

- (a) -1 (b) -1/2
 (c) 0 (d) 1/2

68. The equation of a common tangent to $y^2 = 4x$ and the curve $x^2 + 4y^2 = 8$ can be

- (a) $x - 2y + 2 = 0$
 (b) $x + 2y + 4 = 0$
 (c) $x - 2y = 4$
 (d) $x + 2y = 4$

69. The function $f(x) = (x-3)^2$ satisfies all the conditions of mean value theorem in $\{3, 4\}$. A point on $y = (x-3)^2$, where the tangent is parallel to the chord joining $(3, 0)$ and $(4, 1)$ is

(a) $\left(\frac{7}{2}, \frac{1}{2}\right)$ (b) $\left(\frac{7}{2}, \frac{1}{4}\right)$

- (c) (1, 4) (d) (4, 1)

70. If $x + y - z + xyz = 0$, then

$$\frac{2x}{1-x^2} + \frac{2y}{1-y^2} - \frac{2z}{1-z^2} \text{ is equal}$$

to

(a) $\frac{xyz}{[(1-x^2)(1-y^2)(1-z^2)]}$

(b) $\frac{-xyz}{[(1-x^2)(1-y^2)(1-z^2)]}$

(c) $\frac{8xyz}{[(1-x^2)(1-y^2)(1-z^2)]}$

(d) $\frac{-8xyz}{[(1-x^2)(1-y^2)(1-z^2)]}$

PART-II (Numerical Answer Questions)

71. If one root of the equation $x^2 + px + 12 = 0$ is 4 while the equation $x^2 + px + q = 0$ has equal roots, the value of q is

72. The value of $\cos 36^\circ \cos 42^\circ \cos 78^\circ$ is

[Given : $\sin 18^\circ = \frac{\sqrt{5}-1}{4}$ and $\cos 36^\circ = \frac{\sqrt{5}+1}{4}$]

73. If $x = 1/5$, the absolute value of $\cos(\cos^{-1}x + 2 \sin^{-1}x)$ is

74. If θ_1, θ_2 are the solutions of the equation $2\tan^2\theta - 4 \tan \theta + 1 = 0$, then $\tan(\theta_1 + \theta_2)$ is equal to

75. In a ΔABC , if $\begin{vmatrix} 1 & a & b \\ 1 & c & a \\ 1 & b & c \end{vmatrix} = 0$, then

$$\sin^2 A + \sin^2 B + \sin^2 C =$$