

JEE MAIN- 2024-25 (Part Test-2)

(Physics, Chemistry and Mathematics)

SYLLABUS

Physics :- WPE, COM, Rotational Motion, Gravitation
Chemistry :- Thermodynamics & Thermochemistry
Mathematics :- Quadratic Equation, Sequence & Series

2

PART TEST

CLASS-XIth

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 :-

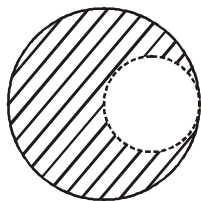
School Name :-

Student's Signature :-

Invigilator's Signature :-

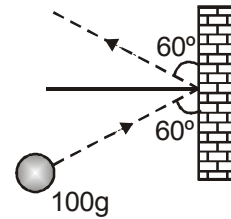
PHYSICS
SECTION-A

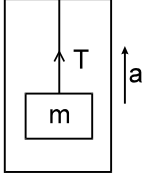
1. The centre of mass of a body :
 (A) Lies always at the geometrical centre
 (B) Lies always inside the body
 (C) Lies always outside the body
 (D) Lies within or outside the body
2. A wheel starts rotating from rest (with constant α) and attains an angular velocity of 60 rad/sec in 5 seconds. The total angular displacement in radians will be
 (A) 60 (B) 80 (C) 100 (D) 150
3. Two particles having mass ratio $n : 1$ are interconnected by a light inextensible string that passes over a smooth pulley. If the system is released, then the acceleration of the centre of mass of the system is :
 (A) $(n-1)^2 g$ (B) $\left(\frac{n+1}{n-1}\right)^2 g$
 (C) $\left(\frac{n-1}{n+1}\right)^2 g$ (D) $\left(\frac{n+1}{n-1}\right) g$
4. If the KE of a body becomes four times its initial value, then the new momentum will be more than its initial momentum by;
 (A) 50% (B) 100% (C) 125% (D) 150%
5. From the theorem of perpendicular axes. If the lamina is in X- Y plane
 (A) $I_x - I_y = I_z$ (B) $I_x + I_z = I_y$
 (C) $I_x + I_y = I_z$ (D) $I_y + I_z = I_x$
6. From a solid sphere of mass M and radius R, a spherical portion of radius R/2 is removed, as shown in the figure. Taking gravitational potential $V = 0$ at $r = \infty$, the potential at the centre of the cavity thus formed is : (G = gravitational constant)



- (A) $\frac{-GM}{2R}$ (B) $\frac{-GM}{R}$
 (C) $\frac{-2GM}{3R}$ (D) $\frac{-2GM}{R}$

7. A mass of 100g strikes the wall with speed 5m/s at an angle as shown in figure and it rebounds with the same speed. If the contact time is 2×10^{-3} sec., what is the force applied on the mass by the wall :



- (A) $250\sqrt{3}$ to right (B) 250 N to right
 (C) $250\sqrt{3}$ N to left (D) 250 N to left
8. A sphere of mass m moving with a constant velocity hits another stationary sphere of the same mass. If e is the coefficient of restitution, then ratio of speed of the first sphere to the speed of the second sphere after collision will be :
 (A) $\left(\frac{1-e}{1+e}\right)$ (B) $\left(\frac{1+e}{1-e}\right)$
 (C) $\left(\frac{e+1}{e-1}\right)$ (D) $\left(\frac{e-1}{e+1}\right)$
9. A block of mass m is suspended by a light thread from an elevator. The elevator is accelerating upward with uniform acceleration a . The work done by tension on the block during t seconds is ($u = 0$) :

 (A) $\frac{m}{2}(g+a)at^2$ (B) $\frac{m}{2}(g-a)at^2$
 (C) $\frac{m}{2}gat^2$ (D) 0
10. In case of earth :
 (A) field is zero, both at centre and infinity
 (B) potential is zero, both at centre and infinity
 (C) potential is same, both at centre and infinity but not zero
 (D) potential is maximum at the centre
11. Two springs have their force constant as k_1 and k_2 ($k_1 > k_2$). When they are stretched by the same force up to equilibrium -
 (A) No work is done by this force in case of both the springs
 (B) Equal work is done by this force in case of both the springs
 (C) More work is done by this force in case of second spring
 (D) More work is done by this force in case of first spring

12. A particle of mass m at rest is acted upon by a force F for a time t . Its kinetic energy after an interval t is :

(A) $\frac{F^2 t^2}{m}$ (B) $\frac{F^2 t^2}{2m}$ (C) $\frac{F^2 t^2}{3m}$ (D) $\frac{Ft}{2m}$

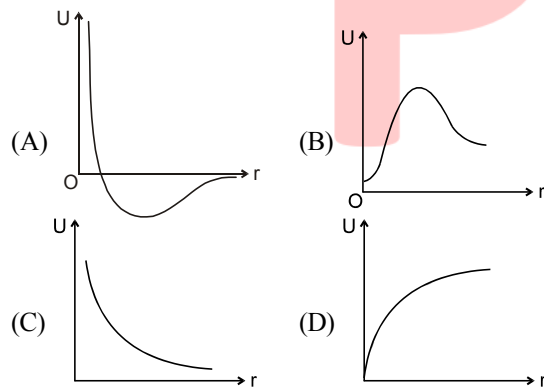
13. A uniform metre stick is held vertically with one end on the floor and is allowed to fall. The speed of the other end when it hits the floor assuming that the end at the floor does not slip :

(A) $\sqrt{4g}$ (B) $\sqrt{3g}$ (C) $\sqrt{5g}$ (D) \sqrt{g}

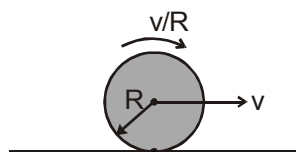
14. A thin circular ring of mass M and radius R is rotating about its axis with a constant angular velocity ω . Two objects each of mass m , are attached gently to the opposite ends of a diameter of the ring. The ring now rotates with an angular velocity

(A) $\frac{\omega M}{M+m}$ (B) $\frac{\omega(M-2m)}{M+2m}$
 (C) $\frac{\omega M}{M+2m}$ (D) $\frac{\omega(M+2m)}{M}$

15. The diagrams represent the potential energy U of a function of the inter-atomic distance r . Which diagram corresponds to stable molecules found in nature.



16. A disc is performing pure rolling on a smooth stationary surface with constant angular velocity as shown in figure. At any instant, for the lower most point of the disc



- (A) Velocity is v , acceleration is zero
 (B) Velocity is zero, acceleration is zero
 (C) velocity is v , acceleration is $\frac{v^2}{R}$.
 (D) velocity is zero, acceleration is $\frac{v^2}{R}$

17. A satellite is in a circular orbit around the earth has kinetic energy E_k . Minimum amount of energy that is added so that it escapes the earth's gravitational field is:

(A) E_k (B) $E_k/2$ (C) $E_k/4$ (D) $2 E_k$

18. **STATEMENT-1** : A rigid disc rolls without slipping on a fixed rough horizontal surface with uniform angular velocity. Then the acceleration of lowest point on the disc is zero.]

STATEMENT-2 : For a rigid disc rolling without slipping on a fixed rough horizontal surface, the velocity of the lowest point on the disc is always zero.

- (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1
 (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 (C) Statement-1 is True, Statement-2 is False
 (D) Statement-1 is False, Statement-2 is True.

19. **Statement-1** : Graph between potential energy of a spring versus the extension or compression of the spring is a straight line.

Statement-2 : Potential energy of a stretched or compressed spring is proportional to square of extension or compression.

- (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 (C) Statement-1 is True, Statement-2 is False
 (D) Statement-1 is False, Statement-2 is True
 (5) Both statements are false

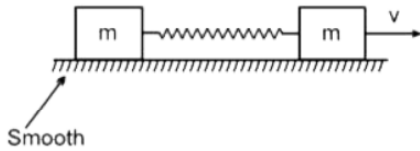
20. An object is placed at a distance of $R/2$ from the centre of earth. Knowing mass is distributed uniformly, acceleration of that object due to gravity at that point is: (g = acceleration due to gravity on the surface of earth and R is the radius of earth)

- (A) g (B) $2g$
 (C) $g/2$ (D) none of these

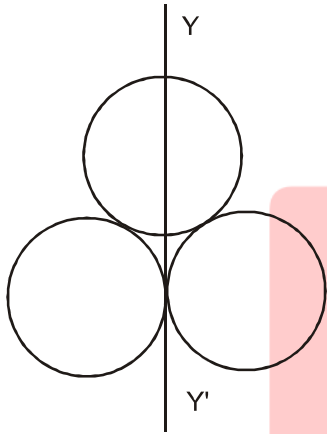
SECTION-B

21. A spring of spring constant 5×10^3 N/m is stretched initially by 5 cm from the unstretched position. Then the work required (in joule) to stretch it further by another 5 cm is nearly

22. Two masses are connected by a spring as shown in the figure. One of the masses was given velocity $v = 2 \sqrt{\frac{k}{m}}$ as shown in figure where 'k' is the spring constant. Then maximum extension in the spring is $x = n \sqrt{\frac{km}{K}}$. Find the value of n (where n is integer number)



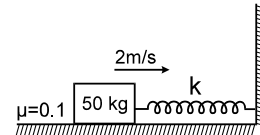
23. Three rings each of mass M and radius R are arranged as shown in the figure. The moment of inertia of the system about YY' will be $\frac{n_1}{n_2} MR^2$. So value of $n_1 + n_2$ is equal to?



24. Acceleration due to gravity on a planet is 10 times the value on the earth. Escape velocity for the planet and the earth are V_p and V_e respectively. Assuming that the radii of the planet and the earth are the same, then $V_p = \sqrt{z} V_e$ then find the value of z.
25. A solid cylinder starts rolling from a height h on an inclined plane. At some instant t, the ratio of its rotational K.E. and the total K.E. will be x : y. Solve the expression $x + y = z$ to find the value of z.

26. Two satellites S_1 and S_2 revolve round a planet in the same direction in circular orbits. Their period of revolution are 1 hour and 8 hour respectively. The radius of S_1 is 10^4 km. The velocity of S_2 with respect to S_1 will be $\pi \times 10^n$ km/hr. Find the value of n.

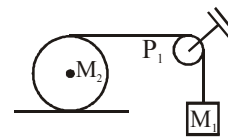
27. A block of mass 50 kg is projected horizontally on a rough horizontal floor. The coefficient of friction between the block and the floor is 0.1. The block strikes a light spring of stiffness $k = 100$ N/m with a velocity 2m/s. The maximum compression of the spring is :



28. A stone projected vertically up with a velocity u reaches a maximum height h. When it is at a height of $3h/4$ from the ground, the ratio of KE and PE at that point is $z_1 : z_2$ so find the value of z_2^2 (consider PE = 0 at the point of projectory)

29. Two particles A and B of mass 1 kg and 2 kg respectively are kept 1 meter apart and are released to move under mutual attraction. When speed of B is 3.6 cm/hour, what is the separation (in cm) between the particles. Take $G = \frac{20}{3} \times 10^{-11}$ Nm²/kg.

30. A light inextensible string passes over a light and frictionless pulley P_1 as shown in the figure. One end of the string is connected to mass $M_1 = 3$ kg and other end is wrapped around a solid cylinder of mass $M_2 = 2$ kg which rolls on a rough horizontal plane. Find the acceleration (in meter/sec²) of the mass M_1 .

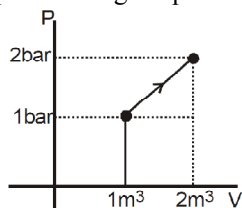


CHEMISTRY

SECTION-A

31. The net heat change in a chemical reaction is same whether it is brought about in two or more different ways in one or several steps. It is known as -
 (A) Hess's law
 (B) Law of conservation of energy
 (C) Henry's law
 (D) Joule's principle
32. The enthalpy of combustion of a substance -
 (A) is always positive
 (B) is always negative
 (C) can be either zero or greater than zero
 (D) is unpredictable till calculations are done.
33. The heat of formation of water is given by :
 (A) $\text{H}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \longrightarrow \text{H}_2\text{O}(\text{l}) ; \Delta\text{H} = -68.3 \text{ kcal}$
 (B) $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \longrightarrow 2\text{H}_2\text{O}(\text{l}) ; \Delta\text{H} = -136.6 \text{ kcal}$
 (C) $\text{H}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \longrightarrow \text{H}_2\text{O}(\text{g}) ; \Delta\text{H} = -86 \text{ kcal}$
 (D) $\text{H}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \longrightarrow \text{H}_2\text{O}(\text{g}) ; \Delta\text{H} = +68.3 \text{ kcal}$
34. From the following data, the heat of formation of $\text{Ca}(\text{OH})_2(\text{s})$ at 18°C is.....kcal :
 $\text{CaO}(\text{s}) + \text{H}_2\text{O}(\text{l}) \longrightarrow \text{Ca}(\text{OH})_2(\text{s}) ;$
 $\Delta\text{H}_{18^\circ\text{C}} = -15.26 \dots\dots(i)$
 $\text{H}_2\text{O}(\text{l}) \longrightarrow \text{H}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) ; \Delta\text{H}_{18^\circ\text{C}} = 68.37 \text{ kcal}$
(ii)
 $\text{Ca}(\text{s}) + \frac{1}{2}\text{O}_2(\text{g}) \longrightarrow \text{CaO}(\text{s}) ;$
 $\Delta\text{H}_{18^\circ\text{C}} = -15.80 \text{ kcal} \dots\dots(iii)$
 (A) -98.69 (B) -235.43
 (C) 194.91 (D) 98.69
35. The heats of neutralisation of four acids a, b, c and d when neutralised against a common strong base are 13.7, 9.4, 11.2 and 12.4 kcal respectively. The weakest acid is :
 (A) a (B) b (C) c (D) d
36. The heat of neutralization of HCN by NaOH is 13.3 kJ/mole, the energy of dissociation of HCN is -
 (A) 43.8 kJ (B) -43.8 kJ
 (C) -68 kJ (D) 68 kJ
37. During complete combustion of one mole of butane, 2658 kJ of heat is released. The thermochemical reaction for above change is -
 (A) $2\text{C}_4\text{H}_{10}(\text{g}) + 13\text{O}_2(\text{g}) \rightarrow 8\text{CO}_2(\text{g}) + 10\text{H}_2\text{O}(\text{l}) \Delta_c\text{H} = -2658.0 \text{ kJ mol}^{-1}$
 (B) $\text{C}_4\text{H}_{10}(\text{g}) + \frac{13}{2}\text{O}_2(\text{g}) \rightarrow 4\text{CO}_2(\text{g}) + 5\text{H}_2\text{O}(\text{l}) \Delta_c\text{H} = -1329.0 \text{ kJ mol}^{-1}$
 (C) $\text{C}_4\text{H}_{10}(\text{g}) + \frac{13}{2}\text{O}_2(\text{g}) \rightarrow 4\text{CO}_2(\text{g}) + 5\text{H}_2\text{O}(\text{l}) \Delta_c\text{H} = -2658.0 \text{ kJ mol}^{-1}$
 (D) $\text{C}_4\text{H}_{10}(\text{g}) + \frac{13}{2}\text{O}_2(\text{g}) \rightarrow 4\text{CO}_2(\text{g}) + 5\text{H}_2\text{O}(\text{l}) \Delta_c\text{H} = +2658.0 \text{ kJ mol}^{-1}$
38. Difference between ΔH and ΔE for the combustion of liquid benzene at 27°C is -
 (A) 7.48 kJ (B) 3.74 kJ
 (C) 14.86 kJ (D) 5.73 kJ
39. The enthalpy of the reaction
 $\text{H}_2\text{O}_2(\text{l}) \rightarrow \text{H}_2\text{O}(\text{l}) + \frac{1}{2}\text{O}_2(\text{g})$ is
 $-23.5 \text{ kcal mol}^{-1}$ and the enthalpy of formation of $\text{H}_2\text{O}(\text{l})$ is $-68.3 \text{ kcal mol}^{-1}$. The enthalpy of formation of $\text{H}_2\text{O}_2(\text{l})$ is -
 (A) -44.8 kcal mol⁻¹ (B) 44.8 kcal mol⁻¹
 (C) -91.8 kcal mol⁻¹ (D) 91.8 kcal mol⁻¹
40. Given that $\Delta\text{H}_{\text{combustion}}$ of cyclopropane is $-4000 \text{ kJ mol}^{-1}$. The amount of cyclopropane that needs to be burnt in oxygen for producing $2 \times 10^5 \text{ kJ}$ of heat is -
 (A) 20 kg (B) 2.1 kg (C) 21 g (D) 210 mg
41. A state function is that -
 (A) Which is used in thermochemistry
 (B) Which obeys all the laws of thermodynamics
 (C) Quantity whose value depends only on the state of the system
 (D) Quantity which is used in measuring thermal change
42. "Heat cannot be itself flow from a body at lower temperature to a body at higher temperature" is a statement or consequence of -
 (A) Conservation of momentum
 (B) Conservation of mass
 (C) First law of thermodynamics
 (D) Second law of thermodynamics

43. What is ΔU for the process described by figure. Heat supplied during the process $q = 100$ kJ.



- (A) +50 kJ (B) -50 kJ
(C) -150 kJ (D) +150 kJ
44. One mole of ideal gas is allowed to expand reversibly and adiabatically from a temperature of 27°C . If the work done by the gas in the process is 3 kJ, the final temperature will be equal to ($C_v = 20$ J/K mol)
- (A) 100 K (B) 450 K
(C) 150 K (D) 400 K
45. The heat of reaction at constant volume (ΔE) and that at constant pressure (ΔH) are related as-
- (A) $\Delta E = \Delta H + \Delta RT$ (B) $\Delta H = \Delta E - nRT$
(C) $\Delta H = \Delta E + \Delta RT$ (D) $\Delta H = \Delta E + nRT$
46. The total entropy change for a system and its surroundings increases, if the process is
- (A) Reversible (B) Irreversible
(C) Exothermic (D) Endothermic
47. For the reaction between CO_2 and graphite $\text{CO}_2(\text{g}) + \text{C}(\text{s}) \rightarrow 2\text{CO}(\text{g})$
 $\Delta H = +170.0$ kJ and $\Delta S = 170$ JK^{-1} . The reaction is spontaneous at -
- (A) 298 K (B) 500 K
(C) 900 K (D) 1200 K.
48. Calculate the temperature at which $\Delta G = -5.2$ kJ mol^{-1} $\Delta H = 145.6$ kJ mol^{-1} and $\Delta S = 216$ $\text{JK}^{-1} \text{mol}^{-1}$ for a chemical reaction -
- (A) 698°C (B) 425°C
(C) 650°C (D) 650°C
49. ΔH for $\text{CaCO}_3(\text{s}) \rightarrow \text{nCaO}(\text{s}) + \text{CO}_2(\text{g})$ is 176 kJ mol^{-1} at 1240 K. The ΔU for the change is equal to :
- (A) 160 kJ (B) 165.6 kJ
(C) 186.3 kJ (D) 180.0 kJ
50. An exothermic reaction has a large positive entropy change. The reaction will be -
- (A) Possible \rightarrow Spontaneous at all temperatures
(B) Possible \rightarrow Spontaneous at low temperatures only
(C) Impossible \rightarrow Non-spontaneous at all temperatures
(D) Possible \rightarrow Spontaneous at high temperatures only

SECTION-B

51. One mole of an ideal monoatomic gas expanded irreversibly in two stage expansion.
- State-1 (8.0 bar, 4.0 litre, 300 K)
State-2 (2.0 bar, 16 litre, 300 K)
State-3 (1.0 bar, 32 litre, 300 K)
Total heat absorbed by the gas in the process is :
52. One mole of ideal gas is allowed to expand reversibly and adiabatically from a temperature of 27°C . If the work done by the gas in the process is 3 kJ, the final temperature will be equal to ($C_v = 20$ J/K mol)
53. Two moles of an ideal gas ($C_v = \frac{5}{2}$) was compressed adiabatically against constant pressure of 2 atm. Which was initially at 350 K and 1 atm pressure. The work involve in the process is equal to
54. Consider the reaction at 300 K
 $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g}) \Delta H^\circ = -185$ kJ
If 3 mole of H_2 completely react with 3 mole of Cl_2 to form HCl. What is ΔU° for this reaction ?
55. What is the free energy change (ΔG) when 1.0 mole of water at 100°C and 1 pressure is converted into steam at 100°C and 1 atm pressure ?
56. The bond enthalpies of H_2 , X_2 and HX are in the ratio of 2 : 1 : 2. If the enthalpy for formation of HX is -50 kJ mol^{-1} , the bond enthalpy of H_2 is -
57. Reaction involving gold have been of particular interest to a chemist. Consider the following reactions.
 $\text{Au}(\text{OH})_3 + 4\text{HCl} \rightarrow \text{HAuCl}_4 + 3\text{H}_2\text{O}$, $\Delta H = -28$ kcal
 $\text{Au}(\text{OH})_3 + 4\text{HBr} \rightarrow \text{HAuBr}_4 + 3\text{H}_2\text{O}$, $\Delta H = 36.8$ kcal
In an experiment there was an absorption of 0.44 kcal when one mole of HAuBr_4 was mixed with 4 moles of HCl. What is the percentage conversion of HAuBr_4 into HAuCl_4 ?
58. The standard molar enthalpies for formation of cyclohexane (l) & benzene (l) at 25°C are -156 & $+49$ kJ/mol respectively. The standard enthalpy of hydrogenation of cyclohexane (l) at 25°C is -119 kJ mol^{-1} . Use these data to estimate the magnitude of the resonance energy of benzene.
59. The value of ΔH° for the reaction $\text{Cu}^+(\text{g}) + \text{I}(\text{g}) \rightarrow \text{CuI}(\text{g})$ is -446 kJ mol^{-1} . If the ionization energy of $\text{Cu}(\text{g})$ is 745 kJ mol^{-1} and the electron affinity of $\text{I}(\text{g})$ is -295 kJ mol^{-1} , then the value of ΔH° for the formation of one mole of $\text{CuI}(\text{g})$ from $\text{Cu}(\text{g})$ and $\text{I}(\text{g})$ is -
60. In the combustion of 4 g of CH_4 , 2.5 kcal of heat is liberated. The heat of combustion of CH_4 is -

MATHEMATICS

SECTION-A

61. The equation whose roots are $\sec^2 \alpha$ and $\operatorname{cosec}^2 \alpha$ can be :
 (A) $2x^2 - x - 1 = 0$ (B) $x^2 - 3x + 3 = 0$
 (C) $x^2 - 9x + 9 = 0$ (D) None of these
62. The least integral value of 'm' for which the expression $mx^2 - 4x + 3m + 1$ is positive for every x R is :
 (A) 1 (B) -2 (C) -1 (D) 2
63. If $\frac{4\alpha}{\alpha^2 + 1} \geq 1, \alpha \in \mathbb{R}$, and $\alpha + \frac{1}{\alpha}$ is an odd integer, then sum of possible values of α is
 (A) 3 (B) 4
 (C) $\frac{3 - \sqrt{5}}{2}$ (D) $\frac{3 + \sqrt{5}}{2}$
64. Let the sequence $a_1, a_2, a_3, \dots, a_{2n-1}, a_{2n}$ form an A.P. Then the value of, $a_1^2 - a_2^2 + a_3^2 - \dots + a_{2n-1}^2 - a_{2n}^2$ is :
 (A) $\frac{2n}{n-1}(a_{2n}^2 - a_1^2)$ (B) $\frac{n}{2n-1}(a_1^2 - a_{2n}^2)$
 (C) $\frac{n}{n+1}(a_1^2 + a_{2n}^2)$ (D) $\frac{n}{n-1}(a_1^2 + a_{2n}^2)$
65. Possible value of 'a' for which one root of quadratic equation $(a^2 - 5a + 3)x^2 + (2a - 3)x + 2 = 0$ is twice of the other, is
 (A) 2 (B) 4 (C) 6 (D) 8
66. Let a_1, a_2, a_3, \dots in A.P. and h_1, h_2, h_3, \dots in H.P. if $a_1 = 2 = h_1$ and $a_{30} = 25 = h_{30}$ then $a_7 h_{24} + a_{14} h_{17}$ is equal to
 (A) 50 (B) 100 (C) 200 (D) 400
67. Find the product of all real values of b for which $\cos^{40} \alpha, \sin^{40} \alpha$ are roots of equation $x^2 + 2bx + b = 0$ and $\cos^{40} \beta, \sin^{40} \beta$ are the roots of the equation $x^2 + 2x - 3 = 0$.
 (A) -1 (B) 2 (C) -4 (D) 4
68. If exp $\left\{ \left(\tan^2 x - x - \tan^4 x + \tan^6 x - \tan^8 x + \dots \right) \log_e 16 \right\}$
 $0 < x < \pi/4$,
 satisfies the quadratic equation $x^2 - 3x + 2 = 0$, then value of $\cos^2 x + \cos^4 x$ is -
 (A) 4/5 (B) 21/16 (C) 17/11 (D) 19/31
69. The number of real roots of the equation $3\left(x + \frac{1}{x}\right) - \left(x + \frac{1}{x}\right)^3 = 0$ is/are:
 (A) 0 (B) 1 (C) 2 (D) 4
70. Sum of all real values of so the equation $x^2 - 3x + 2 = 0$ and $x^2 - 4x + 3 = 0$ has exactly one root common.
 (A) $-\frac{3}{8}$ (B) 1 (C) -1 (D) $\frac{5}{8}$
71. The value of x satisfying the equation $1050 - \left(\frac{1}{2} + \frac{2}{3} + \frac{3}{4} + \dots + \frac{1049}{1050}\right) = \frac{x}{1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{1050}} = \frac{x}{2018}$
 (A) 2018 (B) 2019 (C) 2020 (D) 2021
72. The number of quadratic equations with non - zero roots, which remain unchanged on squaring roots are
 (A) 0 (B) 1 (C) 2 (D) 4
73. If $2x^3 - 9x^2 + 17x - 12 = 0$ and $3x^3 - 11x^2 + 18x - 8 = 0$ have two roots α, β in common, then value of $\alpha(2 + \beta) + \beta(\alpha + 2)$ is
 (A) 2 (B) 6 (C) 8 (D) 14
74. If $x^2 + 3x + 7 = 0$ and $ax^2 + bx + c = 0$ have a common root, such that $a, b, c \in \{1, 2, 3, \dots, 50\}$, then the sum of minimum and maximum values of $a + b + c$ is
 (A) 11 (B) 77 (C) 66 (D) 88
75. If $a, b, c \in \mathbb{R}^+$ such that $a + b + c = 18$; then maximum value of $(a^2 b^3 c^4)$ is -
 (A) $2^{19} \cdot 3^3$ (B) $2^{18} \cdot 3^3$
 (C) $2^{18} \cdot 3^2$ (D) None
76. The sum of all integral values of 'a' for which $(a^2 + a - 2)x^2 + (a + 2)x < 1$ is
 (A) -1 (B) -3 (C) -2 (D) 0
77. Let a, b, c ($a < b < c$) be in AP; a^2, b^2, c^2 are in GP and $a + b + c = 3/2$; then a =
 (A) $\frac{\sqrt{3} + 1}{2\sqrt{3}}$ (B) $\frac{\sqrt{3} - 1}{2\sqrt{3}}$
 (C) $\frac{\sqrt{2} - 2}{2\sqrt{2}}$ (D) None

78. If exactly one root of the equation $x^2 - (\lambda + 1)x + 2\lambda = 0$ lies in the interval $(0, 3)$, then the set of values of λ is
 (A) $(-\infty, 0) \cup (6, \infty)$ (B) $(-\infty, 0] \cup (6, \infty)$
 (C) $(-\infty, 0] \cup [6, \infty)$ (D) $(0, 6)$
79. The 6th term of an A.P. = 2, the value of common different of an A.P. which makes the product $a_1 \cdot a_4 \cdot a_6$ least is -
 (A) $d = 8/5$ (B) $d = 5/4$
 (C) $d = 2/3$ (D) None of these
80. If angles of a quadrilateral are in A.P. whose common difference = 10° , then angle of quadrilateral are -
 (A) $65^\circ, 85^\circ, 95^\circ, 105^\circ$ (B) $75^\circ, 85^\circ, 95^\circ, 105^\circ$
 (C) $65^\circ, 75^\circ, 85^\circ, 95^\circ$ (D) $65^\circ, 95^\circ, 105^\circ, 115^\circ$

SECTION-B

81. Let α and β be the roots of the quadratic equation $x^2 - 6x + 4 = 0$ and $A_n = \alpha^n + \beta^n$ then value of $\frac{A_{50}(A_{48} + A_{49}) - 6A_{49}^2 + 4A_{48}^2}{A_{48}A_{49}}$ is ?
82. Given a, b, c are positive integers forming an increasing G.P., $b - a$ is a perfect square of a natural number, and $\log_6 a + \log_6 b + \log_6 c = 6$ Find the value of $\frac{3(a + b + c)}{111}$

83. If a_1, a_2, a_3, \dots are in A.P. such that $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$, then $a_1 + a_2 + a_3 + \dots + a_{23} + a_{24}$ is equal to
84. Find the sum of integral values of 'a' for which the equation $x^4 - (a^2 - 5a + 6)x^2 - (a^2 - 3a + 2) = 0$ has real roots only.
85. If α, β be roots of $x^2 - 3x + a = 0$ and γ, δ be roots of $x^2 - 12x + b = 0$ and $\alpha, \beta, \gamma, \delta$ (in order) form an increasing G.P. Then $a + b$ is equal to :
86. Let α, β, δ be the roots of equation $x^4 - 3x + 1 = 0$, then the value of $a^3 + \beta^3 + \gamma^3 + \delta^3$ is equal to
87. If $\log_2 2, \log_3 (2^x - 5)$ and $\log_3 (2^x - 7/2)$ are in A.P., then x is equal to
88. The minimum value of the sum of real numbers $a^{-5}, a^{-4}, 3a^{-3}, 1, a^8$ and a^{10} where $a > 0$ is
89. In a certain A.P. 5 times then 5th term is equal to 8 times the 8th term, then the 13th term is-
90. The number of common terms to the two A.P's $17 + 21 + 25 + \dots + 417$ and $16 + 21 + 26 + \dots + 466$ is