Subject: **CHEMISTRY, MATHEMATICS & PHYSICS**

Paper Code: **JEE_ Main_ Sample Paper - IV**

Duration: 3hrs

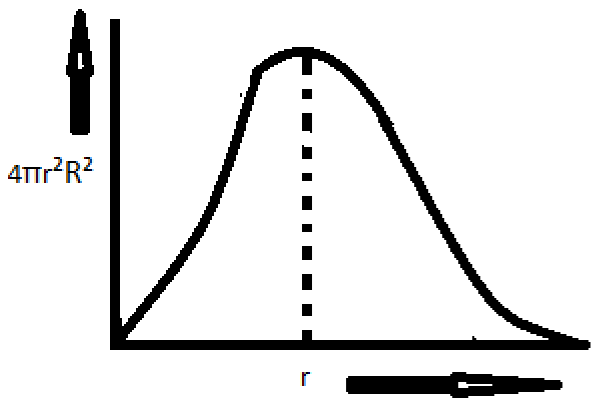
Maximum Marks: 360marks

General Instructions:

1. Immediately fill in the particulars on this page of the Test Booklet with Blue/Black Ball Point Pen. Use of pencil is strictly prohibited.
2. The test is of **3 hours duration.**
3. The Test Booklet consists of **90** questions. The maximum marks are **360.**
4. There are **three** parts in the question paper A, B, C consisting of **Chemistry, Mathematics** and **Physics** having 30 questions in each part of equal weight age. Each question is allotted **4 (four)** marks for correct response.
5. Candidates will be awarded marks as stated above in instruction No. 4 for correct response of each question. (1/4) (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.
6. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instruction 5 above.

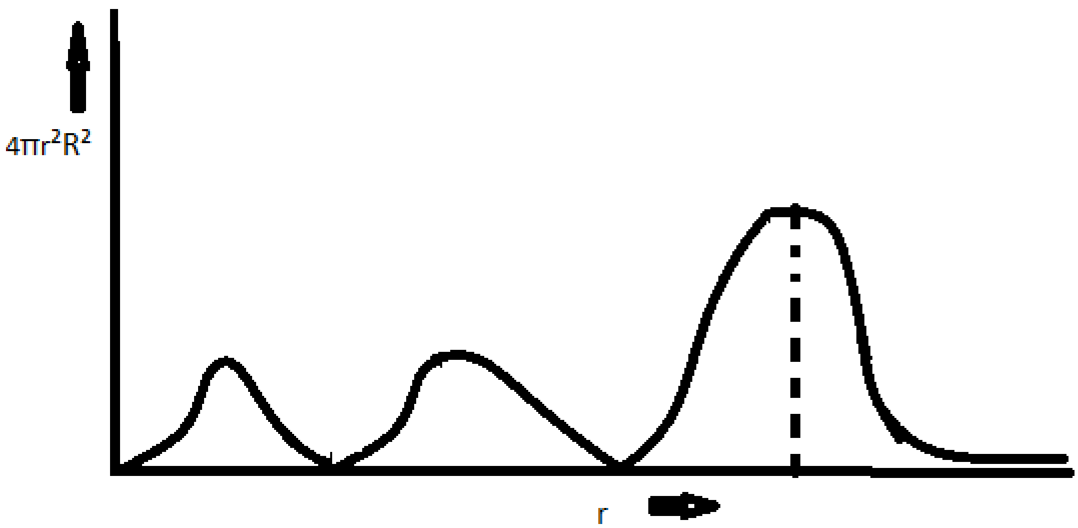
Part – A – Chemistry

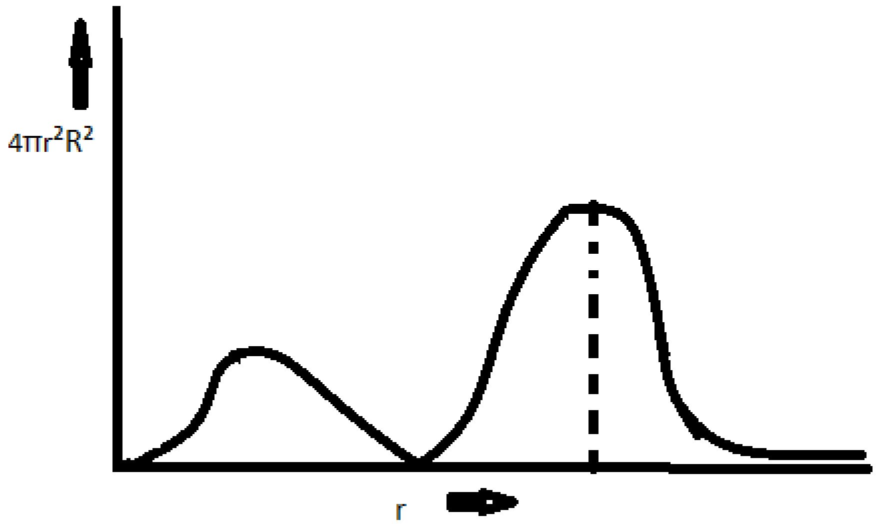
1) Which of the following graphs represents the radial charge density of 3d electron?



A

B





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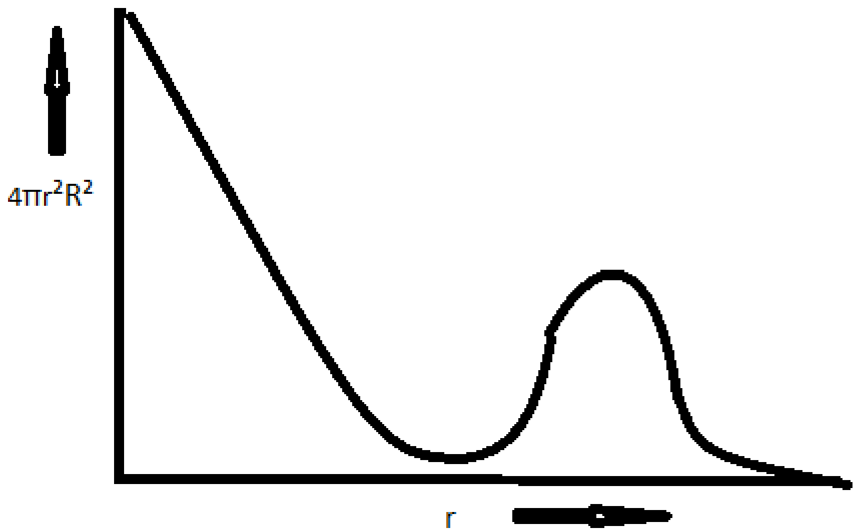


D

2) The energy of electron in first Bohr's orbit of H-atom is -13.6 eV. What will be its potential energy in n = 4.

A -13.6eV

B -3.4eV

C -0.85eV

D -1.70eV

3) The hybridization of atomic orbital of nitrogen in NO_2^+, $NO_3^-$and NH_4^+respectively are

a) sp, sp^3 and sp^2
b) sp, sp^2 and sp^3
c) sp^2, sp and sp^3
d) sp^2, sp^3 and sp

4) 2.5mL of (2/5)M weak mono acidic base $K_b = 1 \times 10^{-12}$ at 25°C) is titrated with (2/15) M HCl in water at 25°C. The concentration of H^+ at equivalence point is

($K_2 = 1 \times 10^{-14}$ at 25°C)

A 3.7×10^{-13}M

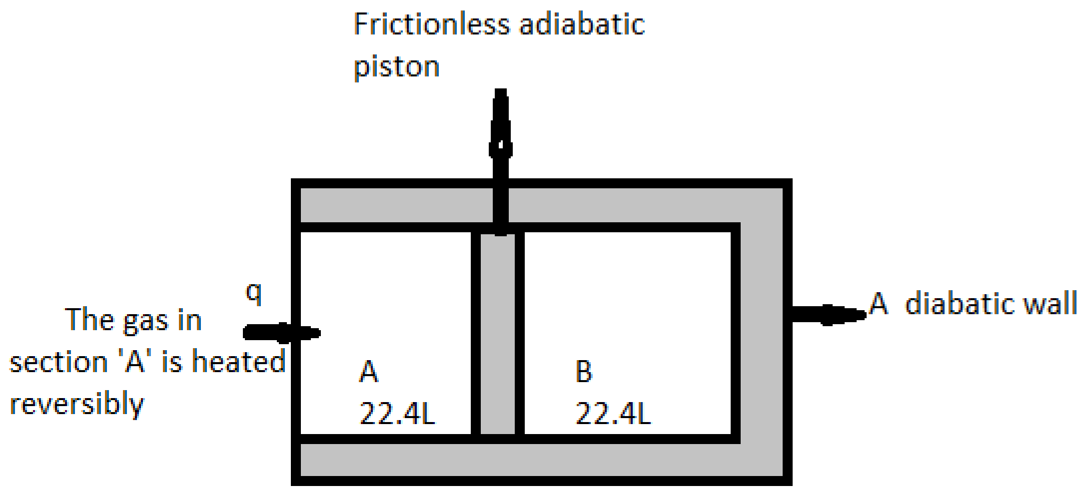
B 3.2×10^{-7}M

C 3.2×10^{-2}M

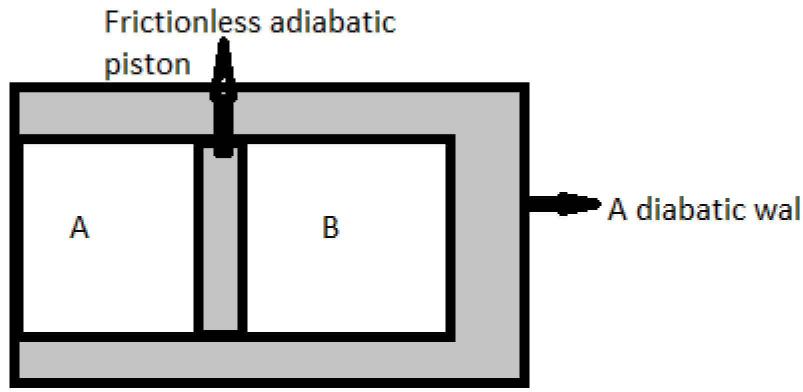
D 2.7×10^{-2}M

5) A cylindrical container of volume 44.8 liters is containing equal to no. of an ideal mono atomic gas in two sections A and B separated by an adiabatic frictionless piston as shown in figure. The initial temperature and pressure of gas in both section is 273K and 1 atm. Now gas in section ‘A’ is slowly heated till the volume of section B becomes (1/8)th of initial volume. Find change in internal energy (ΔE) for section A in cal.

Given: R = 2cal/mol-K, $C_{v,m}$ of mono atomic gas = (3/2)R, AT STP ideal gas occupy 22.4 litre.



Initial state



Final state

A 218.11cal

B 312.52cal

C 483.21cal

D 512.34cal

6) Given ΔH^o_f of $DyCl_3(s)$ = - 994.30kJ mol^{-1}

$$\frac{1}{2}H_2(g)+\frac{1}{2}Cl_2g \xrightarrow{+aq} HCl(aq., 4M);$$

$$\Delta H_f^o = -158.31 kJmol^{-1}$$

$$DyCl_3(s) \xrightarrow[HCl]{aq} DyCl_3(aq., in\ 4MHCl);$$

$$\Delta H_f^o = -180.06 kJ\,mol^{-1}$$

$$Dy(s) \xrightarrow[aq.4M]{+3HCl} DyCl_3(aq., 4MHCl)+\frac{3}{2}H_2(g);$$

$$\Delta H_f^o = x,$$

Calculate x

A -966.5kJ/mol

B -699.43kJ/mol

C -596.6kJ/mol

D -569.6kJ/mol

7) Native silver metal forms a water soluble complex with a dilute aqueous solution of NaCN in the presence of

A nitrogen

B oxygen

C carbon dioxide

D argon

8) Among the following the coloured compound is

A $CuCl$

B $K_3[Cu(CN)_4]$

C CuF_2

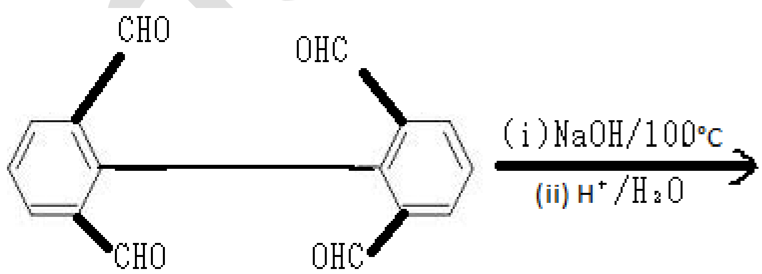
D $[Cu(CH_3CN)_4]BF_4$

9)The reaction is $2NO + Cl_2 \rightarrow 2NOCl$.

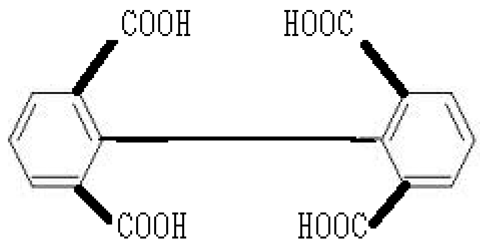
If the concentration of both the reactants is doubled, the rate becomes eight times. What will be the total order?

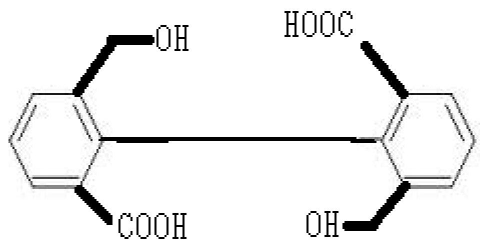
a) 0
b) 2
c) 3
d) 1

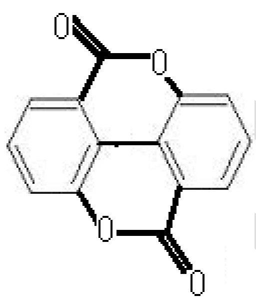
10)

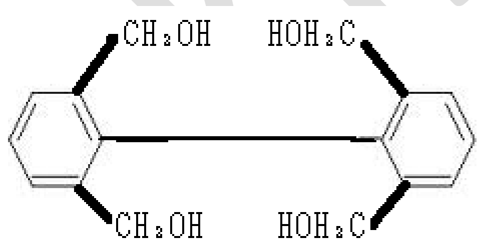


Major product is:

A 

B 

C 

D 

11) Among the following compounds, the most acidic is

A p-nitrophenol

B p-hydrozybenzoic acid

C o-hydroxybenzoic acid

D p-toluic acid

12) How can the following reaction be made to produce in forward direction?

$B(OH)_3 + NaOH \rightarrow NaBO_2 + Na[B(OH)_4] + H_2O$

A addition of Na_2HPO

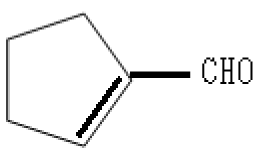
B addition of cis – 1, 2-diol

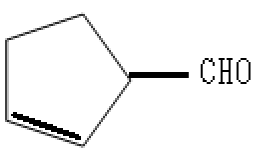
C addition of trans -1, 2-diol

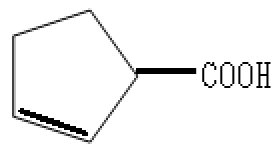
D addition of trans -1, 2-diol

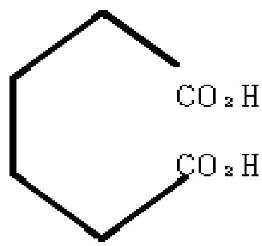
13) Cyclohexene on ozonlysis followed by reaction with zinc dust and water gives compound E. Compound E on further treatment with aqueous KOH yields compound F.

Compound F is –

A 

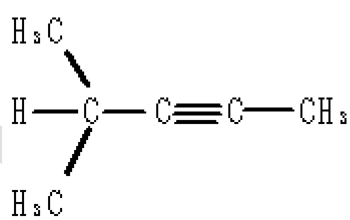
B 

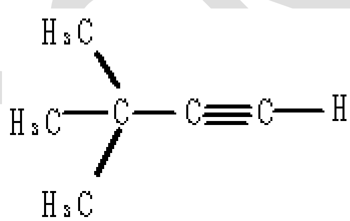
C 

D 

14) The structure of compound P is

A CH=CH-CH=CH-C≡C-H

B 

C 

D None

15)

$$\underset{\text{see}-\text{butyl chloride}}{CH_3-CH_2-\underset{\underset{Cl}{|}}{CH}-CH_3} \xrightarrow{Cl_2,\ \text{heat or light}} \text{Product}$$

Which statement is incorrect?

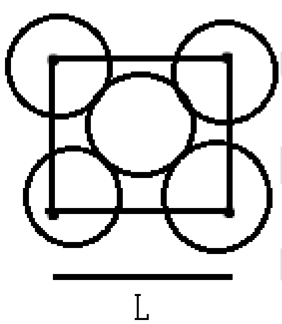
A One of the products exists as three stereoisomers

B Two pairs of diastereomers are obtained only

C only one mesostereoismer is obtained

D two pairs of enantiomers are obtained

16) The packing efficiency of the two-dimensional square unit cell shown below is:



A 39.27%

B 68.02%

C 74.05%

D 78.54%

17) Consider the cell Ag(s) |AgBr(s)|Br^-(aq)||AgCl(s)|Cl^-(aq) |Ag(s) at 25°C. The solubility product constants of AgBr&AgCl are respectively 5 x 10^{-13}& 1 x -10^{-10}. For what ratio of the concentrations of Br^-&Cl^- ions would the emf of the cell be zero?

A 1: 200

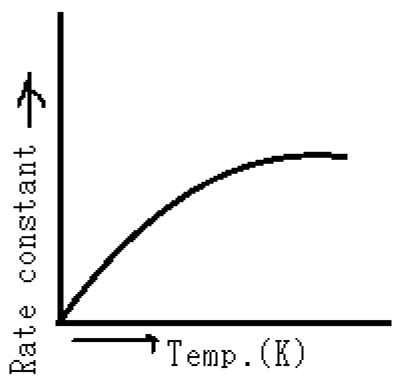
B 1: 100

C 1: 500

D 200: 1

18) If for a first order reaction, rate constant varies with temperature according to the graph given below. At 27°C,

1.5x10^{-4} percent of the reactant molecules are able to cross-over the potential barrier. At 52°C, the slope of this graph is equal to 0.2K^{-1} sec^{-1}, assuming that activation energy does not change in this temperature range.



A 3.14 x 10^{-2} min^{-1}

B 1.35 x $10^{-2}$$min^{-1}$

C $0.75 \times 10^{-2} min^{-1}$

D $8.75 \times 10^{-2} min^{-1}$

19) 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

A Na_2SO_4

B $CaCl_2$

C $Al_2(SO_4)_3$

D NH_4Cl

20) In which of the following the maximum number of lone pairs is present on the central atom?

A $[ClO_3]^-$

B XeF_4

C SF_4

D I_3^-

21) The species having bond order differential from that in CO is –

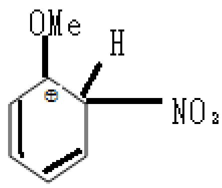
A NO^-

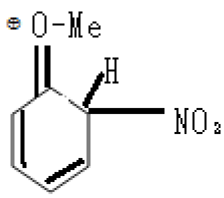
B NO^{+}

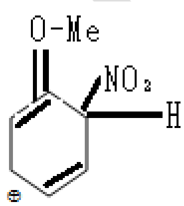
C CN^{-}

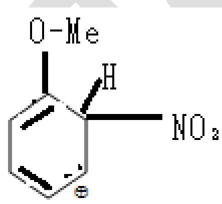
D KO_2

22) Which of the following canonical forms is the most stable?

A 

B 

C 

D 

23) The I – I distance in the given compound $H_2C = C = C = CI_2$ is (Given that C – I bond length is 2.10 Å) –

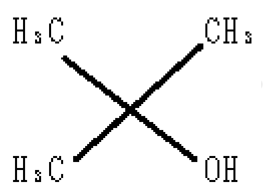
A 1.82 Å

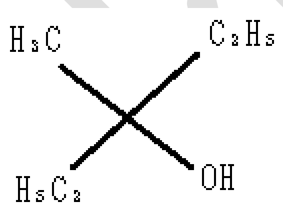
B 3.00 Å

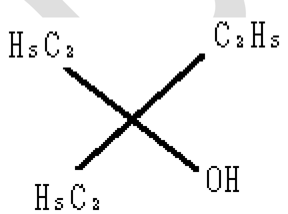
C 3.64 Å

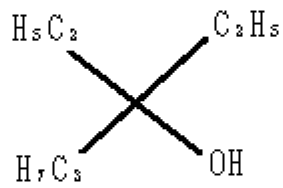
D None of these

24) Ethyl ester $\xrightarrow[\text{excess}]{CH_3MgBr}$ P. The product P will be

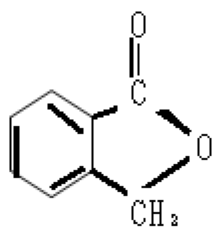
A 

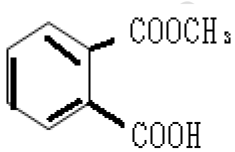
B 

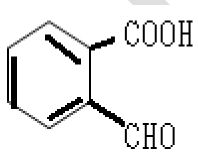
C 

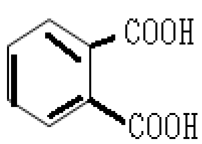
D 

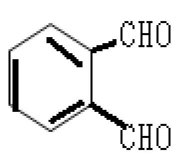
25) Which of the following reactants on reaction with conc. NaOH followed by acidification gives following lactone as the product?



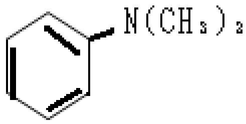
A 

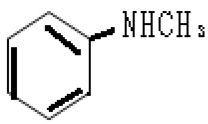
B 

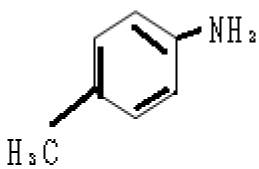
C 

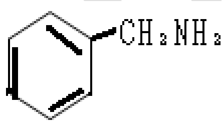
D 

26) Amongst the compounds given, the one that would form a brilliant colored dye on treatment with $NaNO_2$ in dil. HCl followed by addition to an alkaline solution of ß – naphthol is

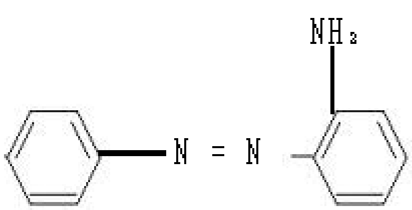
A 

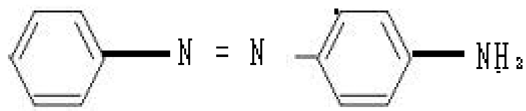
B 

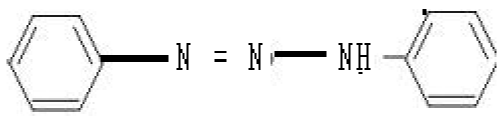
C 

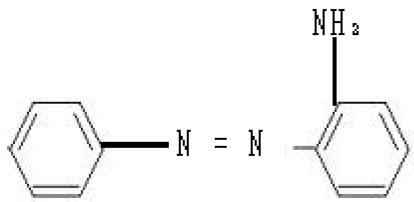
D 

27) When aniline is treated with benzene diazonium chloride at low temperature in weakly acidic medium, the final product obtained is

A 

B 

C 

D 

28) What is the reagent X in the following reaction?

$C_6H_5 - N(CH_3)_2 + X$

$\rightarrow p - (CH_3)_2\, N - C_6H_4\text{-}CO\text{-}C_6H_4\text{-}N(CH_3)_2\text{-}p$

A CO

B CO_2

C $COCl_2$

D $OC(OC_2H_5)_2$

29) Identify the correct order of acidic strengths of

CO_2, CuO, CaO, H_2O:

A $CaO < CuO < H_2O < CO_2$

B $H_2O < CuO < CaO < CO_2$

C $CaO < H_2O < CuO < CO_2$

D $H_2O < CO_2 < CaO < CuO$

30) Ionic radii of –

A $Ti^{4+} < Mn^{7+}$

B $^{35}Cl^- < ^{37}Cl^-$

C $K^+ > Cl^-$

D $P^{3+} > P^{5+}$

<u>Part – B – Physics</u>

31) The relative density of a metal may be found by hanging a block of the metal from a spring balance and noting that in air the balance reads (5.00 ± 0.05) N while in water it reads (4.00 ± 0.05)N. The relative density would be quoted as

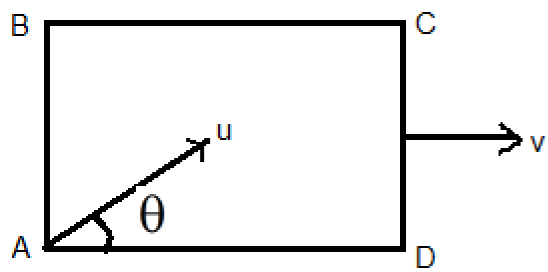
A (5.00 ± 0.05)

B 5.00 ± 11%

C (500 ± 0.10)

D 5.00 ± 6%

32) A smooth square platform ABCD is moving towards right with a uniform speed v. At what angle θ must a particle be projected from A with speed u so that it strikes the point B?



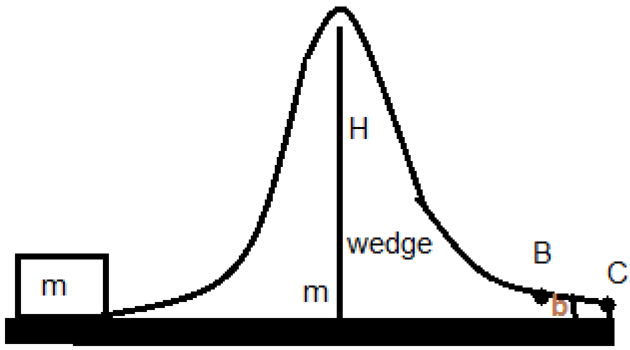
A $\sin^{-1}(u/v)$

B $\cos^{-1}(v/u)$

C $\cos^{-1}(u/v)$

D $\sin^{-1}(v/u)$

33) Figure shows an irregular wedge of mass m placed on a smooth horizontal surface. Part BC is rough. What minimum velocity should be imparted to a small block of same mass m so that it may reach point B –



A 2√(gH)

B √(2gH)

C 2√(g(H-h)

D √(gh)

34) Two coherent sources of different intensities send waves which interfere. The ratio of the maximum intensity to the minimum intensity is 25. The intensities are in the ratio –

a) 25:1
b) 5:1
c) 9:4
d) 625:2

35) A magnet of moment M is lying in a magnetic field or induction B. W_1 is the work done in turning it from 0 to 60 degree &W_2 is the work done in turning it from 30° to 90°. Then –

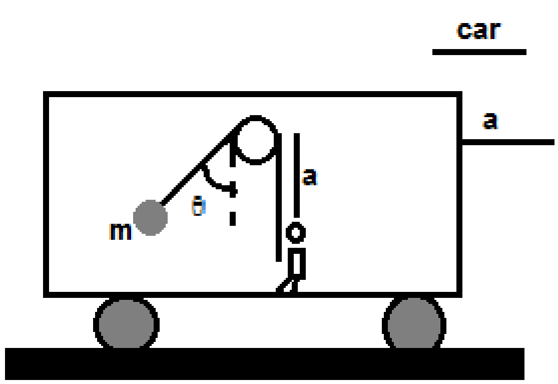
a) $W_2=W_1$

b) $W_2=W_1/2$

c) $W_2= 2W_1$

d) $W_2 = \sqrt{3}W_1$

36) A bob is hanging over a pulley inside a car through, a string. The second end of the string is in the hand of a person standing in the car.The car is moving with constant acceleration a directed horizontally as shown in figure. Other end of the string is pulled with constant acceleration a vertically. The tension in the string is equal to –



A $m\sqrt{(g^2+a^2)}$

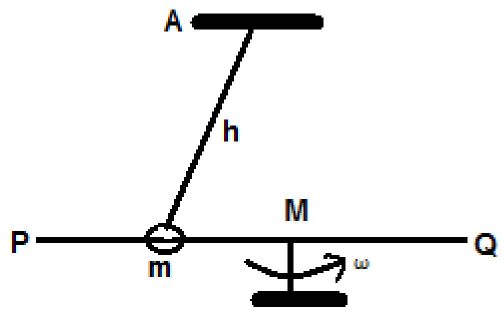
B $m\sqrt{(g^2+a^2)} – ma$

C $m\sqrt{(g^2+a^2)}+ma$

D $m(g+a)$

37) A smooth rod PQ rotates in a horizontal plane about its midpoint M which is h = 0.1m vertically below a fixed point A at a constant angular velocity 14rad/s.

A light elastic string of natural length 0.1m, elastic constant 1.47N/cm has one end fixed at A and its other end attached to a ring of mass m = 0.3gk which is free to slide along the rods. When the ring is stationary relative to rod, then inclination of string with vertical and the tension in string?



A cos θ = 3/5, T = 9.8N

B θ = 60, T = 0

C cos θ = 2/5, T = 4.9N

D θ = 30, T=0

38) A circular plate of uniform thickness has a diameter of 56cm. A circular portion of diameter 42cm is removed from one edge of plate as shown in figure.

Find the position of the centre of mass of the remaining portion.

A 6cm

B 8cm

C 9cm

D 10cm

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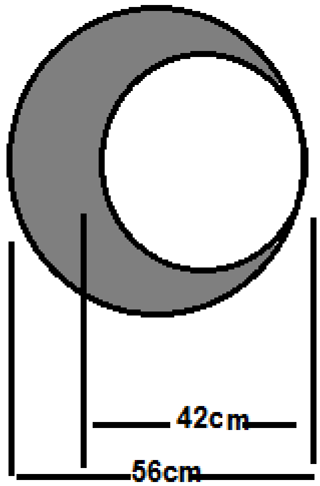
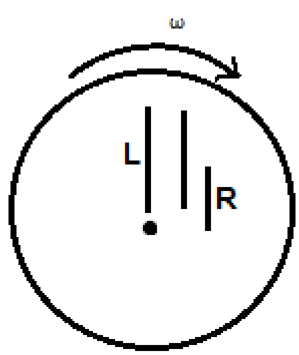


39) A uniform rod of mass M and length L lies radially on a disc rotating with angular speed ω in a horizontal plane about it axis. The rod does not slip on the disc and the centre of the rod is at a distance R from the centre of the disc. Then the kinetic energy of the rod is:



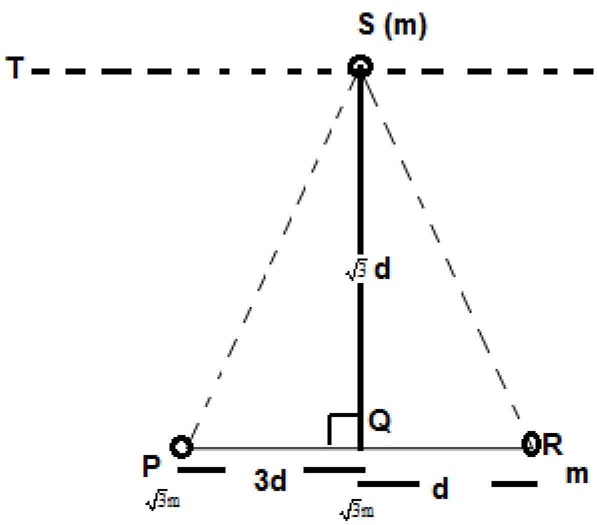
A $\frac{1}{2} m\omega^2 (R^2+L^2/12)$

B $\frac{1}{2} m\omega^2 R^2$

C $1/24\ m\omega^2 L^2$

D none of these

40) Three particles P, Q and R are placed as per given figure. Masses of P, Q are R are √3 m, √3m and m respectively. The gravitational force on a fourth particle 'S' of mass m is equal to



A $\sqrt{3}GM^2/2d^2$ in ST direction only

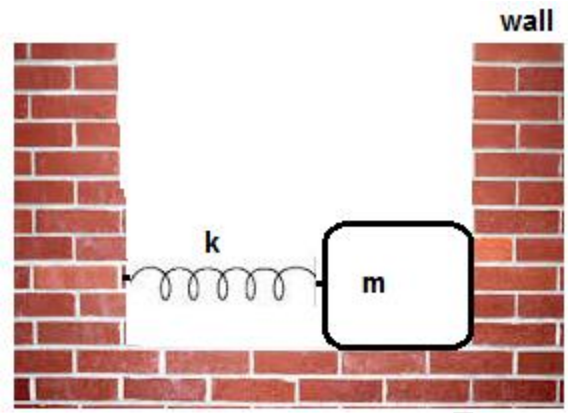
B $\sqrt{3}Gm^2/2d^2$ in SQ direction and $\sqrt{3}Gm^2/2d^2$ in SU direction

C $\sqrt{3}Gm^2/2d^2$ in SQ direction only

D $\sqrt{3}Gm^2/2d^2$ in SQ direction and $\sqrt{3}Gm^2/2d^2$ in ST direction

41) In the figure, the block of mass m, attached to the spring of spring constant k, is in contact with the completely elastic wall, and the compression in the spring is e. The spring is compressed further by e by displacing the block towards the wall ,the block starts oscillating colliding with the wall in each oscillation. If the

collision between the block and the wall is completely elastic , then the time period of oscillations of the block will be



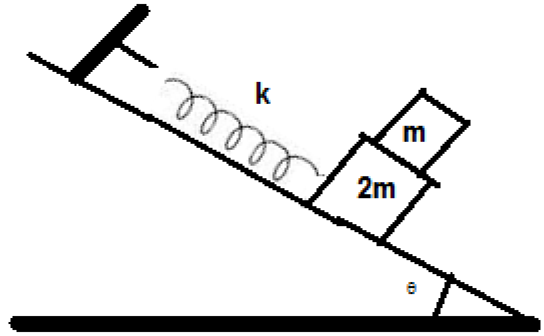
A $\frac{2\pi}{3}\sqrt{\frac{m}{k}}$

B $2\pi\sqrt{\frac{m}{k}}$

C $\frac{\pi}{3}\sqrt{\frac{m}{k}}$

D $\frac{\pi}{6}\sqrt{\frac{m}{k}}$

42) The coefficient of friction between block of mass m and 2m is u = 2tan q. There is no friction between block of mass 2m and inclined plane. The maximum amplitude for oscillations of the two block system for which there is no relative motion between both the blocks is?



A $\sin\theta\sqrt{\frac{k}{m}}$

B $\frac{mg\sin\theta}{k}$

C $\frac{3mg\sin\theta}{k}$

D None of these

43) An open pipe of sufficient length is dipping in water with a speed v vertically. If at any instant l is length of tube water. Then the rate at which fundamental frequency of pipe changes, is

(speed of sound = c)

A $cv/2l^2$

B $cv/4l^2$

C $c/2v^2l^2$

D $c/4v^2l^2$

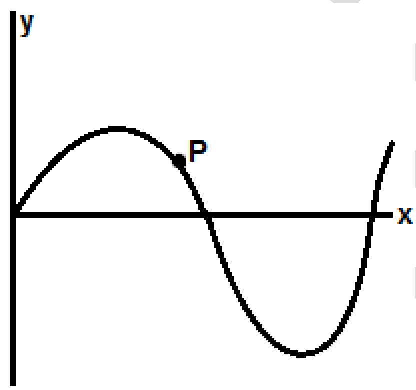
44) A transverse sinusoidal wave moves along a string in the positive x-direction at a speed of 10cm/s. The wavelength of the wave is 0.5m and its amplitude is 10cm. At a particular time t, the snap-shot of the wave is shown in figure. The velocity of point P when its displacement is 5cm is in which direction

A positive y

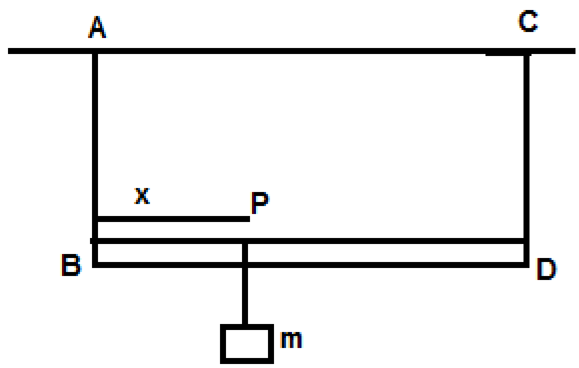
B positive x

C negative y

D negative x



45) A massless rod BD of length *l* is suspended by two identical mass less strings AB and CD of equal lengths. A block of mass m is suspended from point P such that BP is equal to x. If the fundamental frequency of the left wire is twice the fundamental frequency of right wire, then the value of x is



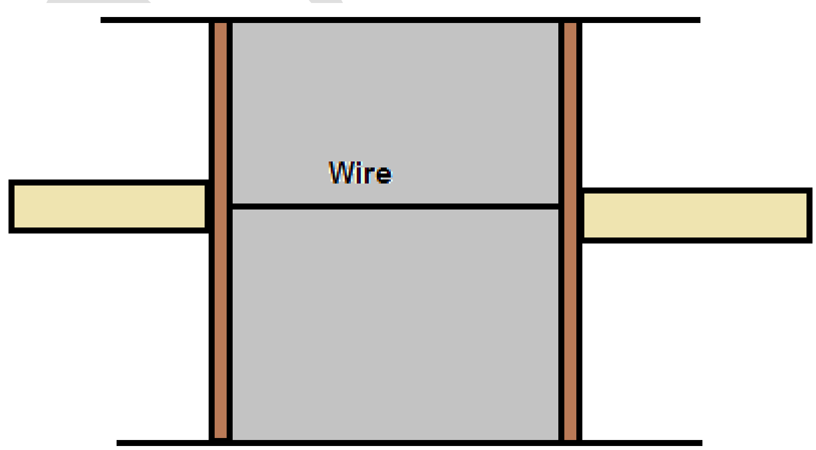
A l/5

B l/4

C 4l/5

D 3l/4

46) A cylindrical tube of uniform cross-sectional area A is fitted with two air tight frictionless pistons. The pistons are connected to each other by a metallic wire. Initially the pressure of the gas is P_0 and temperature is T_0. Atmospheric pressure is also P_0. Now the temperature of the gas is increased to $2T_0$, the tension in the wire will be



A $2P_0A$

B P_0A

C $P_0A/2$

D $4P_0A$

47) The equation of progressive wave is given by y = sin $\left[\pi\left(\frac{t}{5}-\frac{x}{9}\right)+\frac{\pi}{6}\right]$ cm.

which one of the following is correct?

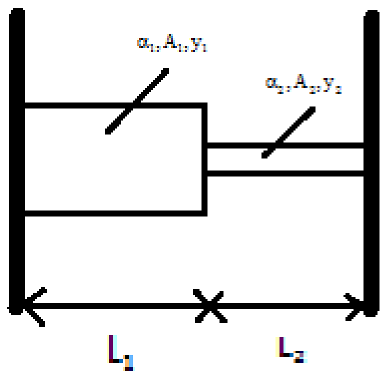
a) v = 5 cm/sec
b) λ = 18 cm
c) A = 0.04 cm
d) F = 50 Hz

48) Two elastic rods are joined between fixed supports as shown in the figure. Condition for no change in the lengths of individual rods with the increase of temperature

(α_1, α_2 = linear expansion co-efficient

A_1, A_2 = Area of rods

y_1, y_2 = Young modulus)



A $A_1/A_2 = \alpha_1 y_1/\alpha_2 y_2$

B $A_1/A_2 = L_1\alpha_1 y_1/L_2\alpha_2 y_2$

C $A_1/A_2 = L_2\alpha_2 y_2/L_1\alpha_1, y_1$

D $A_1/A_2 = \alpha_2, y_2/\alpha_1 y_1$

49) In Young's double slit experiment, the separation between the slits is halved and the distance between slits and the screen is doubled. The fringe which is

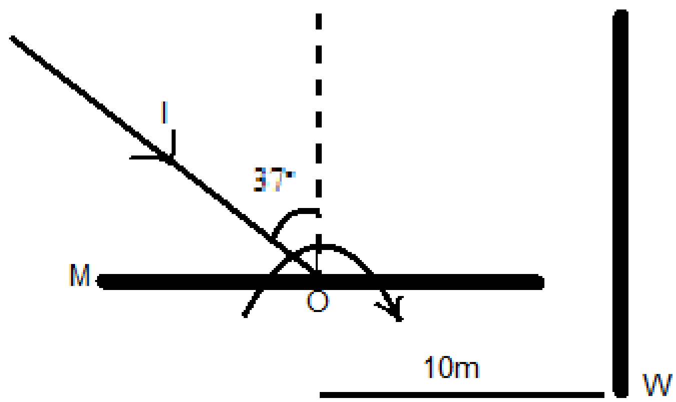
A unchanged

B halved

C doubled

D four times

50) A light ray I is incident on a plane mirror M. The mirror is rotated in the direction as shown in the figure by an arrow at frequency $9/\pi$ rps. The light reflected by the mirror is received on the wall W at a distance 10m from the axis of rotation. When the angle of incidence becomes 37^{o} the speed of the spot (a point) on the wall is:



A 10m/s

B 1000m/s

C 500m/s

D None of these

51) Two symmetric double convex lenses A and B have same focal lengths, but the radii of curvature differ so that $R_A = 0.9\ R_B$. If $n_A = 1.63$, find n_b.

A 1.7

B 1.6

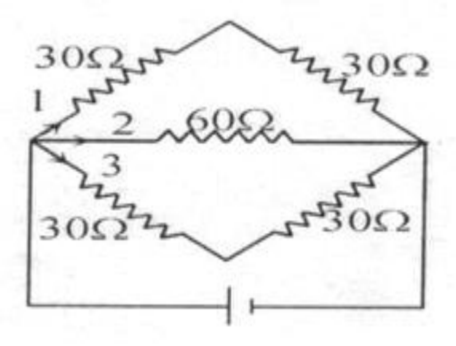
C 1.5

D 4/3

52) An LRC circuit consists of R = 25Ω and the reactance of C and L are 12Ω and 24Ω respectively. The impedance of circuit is

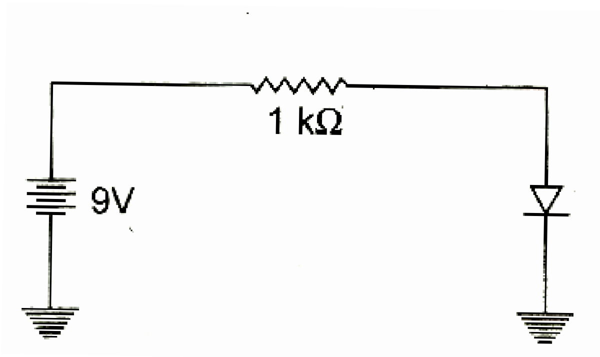
a) 21Ω
b) 27.7Ω
c) 13Ω
d) 5Ω

53) What is the relation between current I_1, I_2 and I_3 in branch 1,2 and 3?



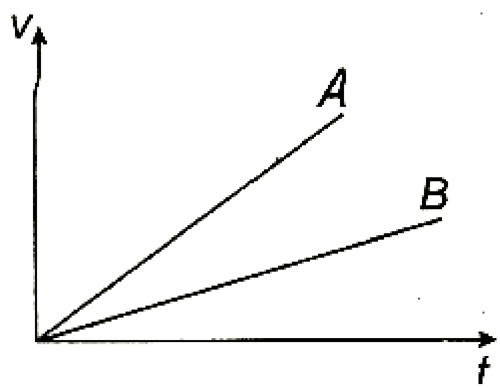
a) $I_1 = I_2 = I_3$
b) $I_1 = I_2 = 2I_3$
c) $I_1 + I_2 = \frac{1}{2}$
d) No relation between them

54) The source voltage is 9 V and the source resistance is 1 k Ω. The current through the diode is



a) 3.8 mA
b) 4.2 mA
c) 0.833 mA
d) 8.3 mA

55) The velocity versus time graph for two particles A and B are plotted as shown in figure. The relative velocity of A with respect to B is



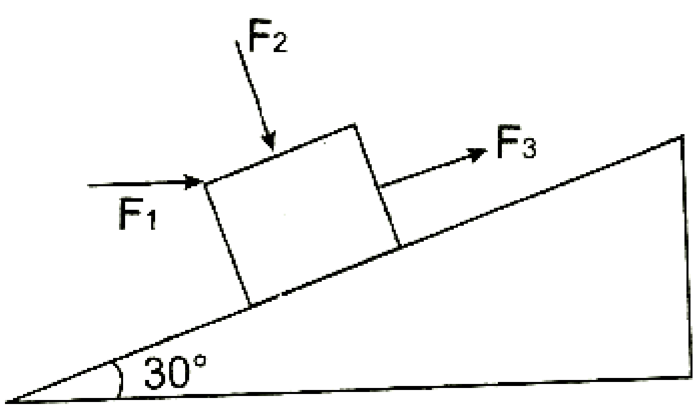
a) positive and continuously increasing
b) negative and continuously increasing
c) positive and continuously decreasing

d) negative and continuously decreasing

56) Two spherical vessels of equal volume are connected by 'a narrow tube. The apparatus contains an ideal gas at 1 atm and 300 K. Now, if one vessel is immersed in a bath of constant temperature 600K and other in a bath of constant temperature 300K, then common pressure will be

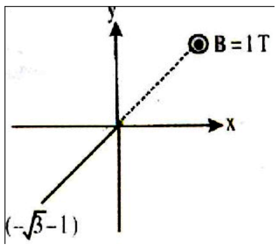
a) 1 atm
b) 4/5 atm
c) 4/3 atm
d) 3/2 atm

57) A block moves up a 30° incline under the action of certain forces, three of which are shown in figure. $\vec{F}_1$ is horizontal and of magnitude 40 N. $\vec{F}_2$ is normal to the plane and of magnitude 20 N. $\vec{F}_3$ is parallel to the plane and of magnitude 30 N. Determine the work done by each force as the block (and point of application of each force) moves 80 cm up the incline.



a) 28 J, 34.6 J, 24 J
b) 28 J,0 J, 24 J
c) 24 J, 44 J, 15 J
d) None of these

58) A uniform magnetic field of magnitude 1 T exists in region y$\geq$0 is along $\hat{k}$ direction as shown.



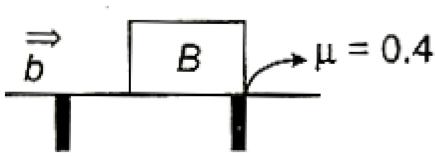
A particle of charge 1 C is projected from point $(-\sqrt{3},-1)$ towards origin with speed 1m/sec. if mass of particle is 1 kg, then co-ordinates of centre of circle in which particle moves are-

a) $(1,\sqrt{3})$
b) $(1,-\sqrt{3})$
c) $\left(\frac{1}{2},-\frac{\sqrt{3}}{2}\right)$
d) $\left(\frac{\sqrt{3}}{2},\frac{1}{2}\right)$

59) A particle of charge q and mass m moves in circular orbit of radius r with angular speed $\therefore B_I = B_{IV} > B_{II} = B_m\ \omega$. The ratio of the magnitude of its magnetic moment to that of its angular momentum depends on

a) ω and q
b) ω,q and m
c) Q and m
d) ω and m

60) A 20 g bullet is fired horizontally with a speed of 600 m/s into a 7 kg block sitting on a table top; the bullet (b) lodges in the block (B). If the coefficient of kinetic friction between the block and the table top is 0.4 what is the distance the block will slide?



a) 0.5 m
b) 1.2 m
c) 0.37 m
d) 0.85 m

Part – C – Math

61) The domain of definition of the function y(x) is given by the equation $2^x + 2^y = 2$ is

A $0 < x \leq 1$

B $0 \leq x \leq 1$

C $-\infty < x \leq 0$

D $-\infty < x \leq 1$

62) $\lim_{x \to 1} \frac{\sqrt{1 - \cos 2(x-1)}}{x-1}$

A exists and it equals √2

B exists and it - √2

C does not exist because x – 1 → 0

D does not exist because left hand limit is not equal to right hand limit

63) The angle of intersection of the curves $y^2 = 2x/\pi$ and $y = \sin x$ is

A $\tan^{-1}(- 1/\pi)$

B $\cot^{-1}(- 1/\pi)$

C $\cot^{-1}(\pi)$

D $\tan^{-1}(\pi)$

64) Area included between the two curves $y^2 = 4ax$ and $x^2 = 2\pi$ is

A 0

B 2π sq. units

C π sq. units

D 4π sq. units

65) The $2x^2 + 3y^2 – 8x – 18y + 35 = k$ represents

A no locus if $k > 0$

B an ellipse if $k > 0$

C a point if $k = 0$

D a hyperbola if $k > 0$

66) Angle of intersection of two circles is given by

A $\sec\theta = (r^2_1 + r^2_2 - d^2)/2r_1r_2$

B $\cos\theta = (r^2_1 + r^2_2 - d^2)/r^2_1r^2_2$

C $\sec\theta = 2r_1r_2/(r_1^2 + r^2_2 - d^2)$

D None of these

67) The angle between the tangents drawn from the point (1, 4) to the parabola $y^2 = 4x$ is

A $\pi/6$

B $\pi/4$

C $\pi/3$

D $\pi/2$

68) If P, Q and R are subsets of a set A, then $R \times (P^C \cup Q^C)^C$ equals:

A $(R \times P) \cap (R \times Q)$

B (R x P) ∪ (R x Q)

C (R x Q) ∩ (R x P)

D None of the above

69) For any complex number z, the minimum value of |z| + |z – 1| is:

A 1

B 0

C ½

D 3/2

70) The real root of the equation $7^{\log_7 (x^2-4x+5)} = x - 1$ is:

A 1 and 2

B 2 and 3

C 3 and 4

D 4 and 5

71) If a, b, c are in G.P. where b – c, c – a, a – b are in H.P. then the value of a + b + c is:

A 0

B - 2ac

C $-3\sqrt{(ac)}$

D none of these

72) The total number of seven digit numbers then sum of whose digits is even is:

A 9×10^6

B 45×10^5

C 81×10^5

D 9×10^5

73) If $(1+x-2x^2)^6 = 1 + a_1x + a_2x^2 \ldots\ldots + a_{12}x^{12}$, then value of $a_2 + a_4 + a_6 + \ldots. + a_{12}$ is equal to:

A 30

B 31

C 32

D None of these

74) The value of λ for which the system of equations

3x-y+4z=3

x+2y-3z=-2

$6x+5y-\lambda z=-3$

Has infinite solutions, is equal to

A 5

B -5

C 0

D None of these

75) If $X = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, the value of X^n is equal to:

A $\begin{bmatrix} 3n & -4n \\ n & n \end{bmatrix}$

B $\begin{bmatrix} 2+n & 5-n \\ n & -n \end{bmatrix}$

C $\begin{bmatrix} 3^n & (-4)^n \\ 1^n & (-1)^n \end{bmatrix}$

D None of these

76) $|\tan x + \sec x| = |\tan x| + |\sec x|$, where $x \in [0, 2\pi]$ if and only if x belongs to the interval

A $[0, \pi]$

B $[0, \pi/2) \cup (\pi/2, \pi]$

C $[\pi, 3\pi/2) \cup (3\pi/2, 2\pi]$

D (π, 2 π]

77) In a triangle ABC, if tan (A/2) = 5/6 and tan (B/2) = 20/37, the sides a, b and c are in

A A.P.

B GP

C H.P

D none of these

78) A flagstaff stands in the center of a rectangular field whose diagonal is 1200m, and subtends angles 15^o and 45^o at the midpoints of the sides of the field. The height of the flagstaff is

A 200m

B 300√(2+√3)m

C 300√(2-√3) m

D 400m

79) If a, b, c are distinct odd integers and ω is non-real cube root of unity, then the minimum value of $|a\omega^2 + b + c\omega|$, is

A 0

B 2√3

C 3

D 1

80) The plane $ax + by = 0$ is rotated through an angle α about its line of intersection with the plane $z = 0$. The equation of the plane in new position is

A $ax + by \pm z\sqrt{(a^2+b^2)} \tan\alpha = 0$

B $(ax + by)\sqrt{(a^2+b^2)} \pm z \tan\alpha = 0$

C $(ax + by)\tan\alpha \pm z\sqrt{(a^2+b^2)} = 0$

D $ax + by \pm \sqrt{(a^2+b^2)}\, z = \tan\alpha$

81) A five-digit numbers divisible by 3 is to be formed using the numerals 0, 1, 2, 3, 4 and 5 without repetition. The total number of ways this can be done is

A 216

B 240

C 600

D 3125

82) The value of the integral $\int \frac{\cos^3 x + \cos^5 x}{\sin^2 x + \sin^4 x} dx$ is

A $\sin x - 6\tan^{-1}(\sin x) + C$

B $\sin x - 2(\sin x)^{-1} + C$

C $\sin x - 2(\sin x)^{-1} + 6\tan^{-1}(\sin x) + C$

D $\sin x - 2(\sin x)^{-1} + 5\tan^{-1}(\sin x) + C$

83) Solution of the differential equation

$\left(e^{x^2} + e^{y^2}\right) y \frac{dy}{dx} + e^{x^2}\left(xy^2 - x\right) = 0$, is

A $e^{x^2}\left(y^2 - 1\right) + e^{y^2} = C$

B $e^{y^2}\left(x^2 - 1\right) + e^{x^2} = C$

C $e^{y^2}\left(y^2 - 1\right) + e^{x^2} = C$

D $e^{x^2}\left(y - 1\right) + e^{y^2} = C$

84) The scalar $\vec{A}.\left(\vec{B} + \vec{C}\right) x \left(\vec{A} + \vec{B} + \vec{C}\right)$ equals:

A 0

B $\left[\vec{A}\ \vec{B}\ \vec{C}\right] x \left[\vec{B}\ \vec{C}\ \vec{A}\right]$

C $\left[\vec{A}\ \vec{B}\ \vec{C}\right]$

D None of these

85) Let r be the range and $S^2 = 1/(n-1) \sum_{i=1}^{n} (x_i - \bar{x})^2$ be the S.D. of a set of observations $x_1, x_2, \ldots\ldots\ldots x_n$, then

A $S \le r\sqrt{\frac{n}{n-1}}$

B $S = r\sqrt{\frac{n}{n-1}}$

C $S \ge r\sqrt{\frac{n}{n-1}}$

D None of these

86) Find the equation of the circles which pass through the ends of the common chords of two circles $2x^2 + 2y^2 + 8x + 4y - 7 = 0$ and $x^2 + y^2 - 8x - 4y - 5 = 0$ and touch the line $x = 7$.

A $x^2+y^2+120x-60y+11=0$

B $x^2+y^2-120x-60y+11=0$

C $x^2+y^2+120x+60y+11=0$

D $x^2+y^2+120x-60y-11=0$

87) The equation of a line through the point of intersection of the lines $x - 3y + 1 = 0$ and $2x + 5y - 9 = 0$ and whose distance from the straight is $\sqrt{5}$ is –

a) $2x + y - 5 = 0$
b) $2x - y + 5 = 0$
c) $2x + y - 10 = 0$
d) $2x - y - 10 = 0$

88) The locus of a point in the Argand plane that moves satisfying the equation,

$|z-1+i|-|z-2-i|=3$

a) Is a circle with radius 3 and centre at z = 3/2
b) Is an ellipse with its foci at 1-i and 2+i and its transverse axis = 3
c) Is hyperbola with its foci at 1 – i and 2+ i and its transverse axis = 3
d) Is none of the above

89) If the tangents are drawn from any point on the line x + y = 3 to the circle $x^2 + y^2 = 9$, then the chord of contact passes through the point –

a) (3,5)
b) (3,3)
c) (5,3)
d) None of these

90) If x satisfies $|x-1|+|x+2|+|x-3| \geq 6$ than

a) $0 \leq x \leq 4$
b) $x \leq -2$ or $x \geq 4$
c) $x \leq 0$ or $x \geq 4$
d) $0 < x < 4$