Competishun

52/6, Opposite Metro Mas Hospital, Shipra Path, Mansarovar

Date: 24/06/2024

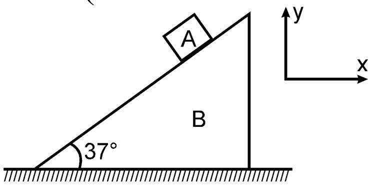
Time: 3 hours **Max. Marks:** 300

PRAVEEN-2_(24-25)_MCT-2

Physics

Single Choice Question

Q1 In the figure shown the acceleration of A is, $\overrightarrow{a_A} = 15\hat{i} + 15\hat{j}$then the acceleration of B is: (A remains in contact with B)



a) $6\hat{i}$ b) $-15\hat{i}$ c) $-10\hat{i}$ d) $-5\hat{i}$

Q2 A particle moves in x – y plane such that it's x and y coordinate vary as x = sin(2t) and y = cos(4t) then it's equation of path is given by :

a) $y^2 = 1 - x$ b) $y = 1 - 2x^2$ c) $x^2 = 1 - 2y$ d) $y^2 = x^2 - 1$

Q3 A ship is selling due north with speed 9 m/s in sea. Wind is blowing with speed $\sqrt{2}$ m/s from S–W direction. A person holding a flag in his hand running on the deck of ship with speed 3 m/s due east relative to ship. Direction in which flag will flutter :

a) $\tan^{-1}(2)$ W of N b) $\tan^{-1}(2)$ S of E c) $\tan^{-1}(2)$ N of W d) none of these

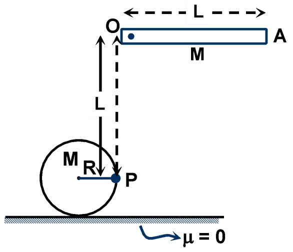
Q4 Engine of a fast moving train crosses a pole with speed 15 m/s while its guard compartment crosses the same pole with speed 20 m/s. If train has length 500 m and speed changes uniformly, find time to cross the pole by train :

a) $\frac{100}{3}$ sec. b) $\frac{200}{7}$ sec. c) $\frac{50}{3}$ sec. d) data is insufficient

Q5 Moment of inertia of a uniform solid cone about an axis passing through its centre of gravity and parallel to its base is (m is mass of cone, its height is h and its radius R = h)

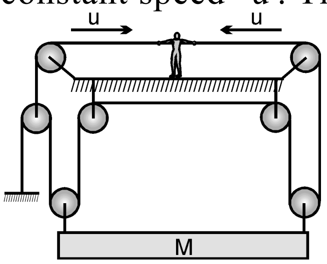
a) $\frac{10}{3}MR^2$ b) $\frac{3}{5}MR^2$ c) $\frac{3}{10}MR^2$ d) $\frac{3}{16}MR^2$

Q6 A slender rod of mass M and length L hinged at O is kept horizontal and then released. The other end of the rod strikes a solid sphere of mass M and radius R (at point P) kept on a smooth horizontal surface. The points O and P are on the same vertical line. After the collision, the rod comes to rest. The angular speed of the sphere after the collision is



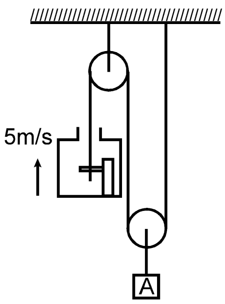
a) $\sqrt{\frac{3g}{L}}$ b) $\frac{R}{L}\sqrt{\frac{3g}{L}}$ c) $\frac{L}{R}\sqrt{\frac{3g}{L}}$ d) zero

Q7 System is shown in the figure and man is pulling the rope from both sides with constant speed ' u'. Then the speed of the block will be:



a) $\frac{3u}{4}$ b) $\frac{3u}{2}$ c) $\frac{u}{4}$ d) none of these

Q8 A motor is fixed inside a box which is moving upwards with velocity 5 m/s. String is winding at the rate 3 m/s. Then the velocity of block A will be

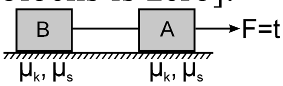


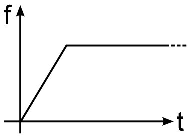
a) 2.5 m/s downwards b) 5 m/s downwards c) 1 m/s downwards
d) 2 m/s downwards

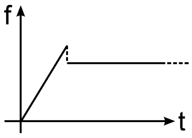
Q9 A body of mass $1000 \mathrm{~kg}$ is moving horizontally with a velocity $6 \mathrm{~m/s}$. If $200 \mathrm{~kg}$ extra mass is added, the final velocity (in $\mathrm{m/s}$) is:

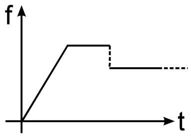
a) 6 b) 2 c) 3 d) 5

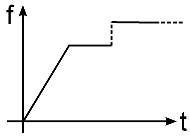
Q10 A force F = t is applied to a block A as shown in figure, where t is time in seconds. The force is applied at t = 0 seconds when the system was at rest. Which of the following graph correctly gives the frictional force between A and horizontal surface as a function of time t.[Assume that at t = 0, tension in the string connecting the two blocks is zero].



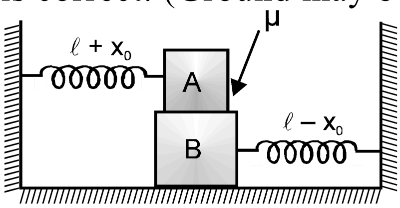
a) 

b) 

c) 

d) 

Q11 For the system shown in figure two spring are identical and have spring constant K. Friction coefficient between the blocks is μ. The mass of each block is ' m '. By the time the two springs come in their natural length (ℓ), which of the following statement is correct. (Ground may be rough or smooth)



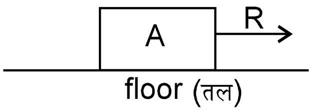
a) Work done by friction on block A is positive

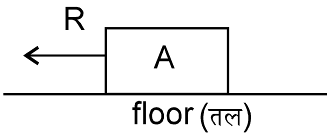
b) Work done by friction on block B is positive

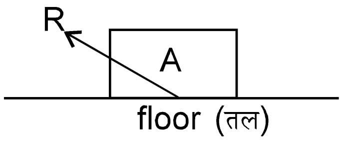
c) Work done by friction on system A + B is positive

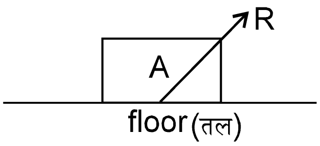
d) None of these

Q12 A box 'A' is lying on the horizontal floor of the compartment of a train running along horizontal rails from left to right. At time 't', it decelerates. Then the reaction R by the floor on the box is given best by :

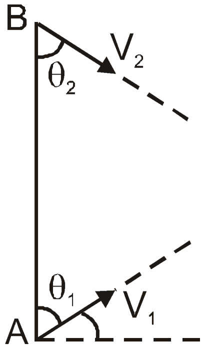
a) 

b) 

c) 

d) 

Q13 Two balls are projected from points A and B in a vertical plane as shown in figure. AB is a straight vertical line. The balls will collide in mid–air if $\frac{V_1}{V_2}$ is equal to :

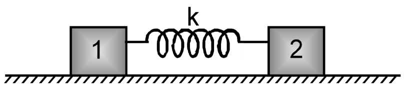


a) $\frac{\sin\theta_2}{\sin\theta_1}$ **b)** $\frac{\sin\theta_1}{\sin\theta_2}$ **c)** $\frac{\cos\theta_2}{\cos\theta_1}$ **d)** $\frac{\cos\theta_1}{\cos\theta_2}$

Q14 A man throws a packet from the top of the tower directly aiming at his friend who is standing on the ground at a certain distance from the base of the tower and this distance is same as the height of the tower. If packet is thrown with a speed of 4m/s and it hits the ground midway between the tower base & his friend then height of the tower is (g = 10m/s^2)

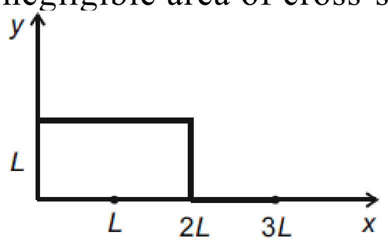
a) 5m **b)** 8m **c)** 3.2m **d)** 13m

Q15 Two blocks of masses m_1 and m_2 are connected by spring of constant K. The spring is initially compressed and the system is released from rest at t = 0 second. The work done by spring on the blocks m_1 and m_2 be W_1 and W_2 respectively by time t. The speeds of both the blocks at time 't' are non zero. Then the value of $\frac{W_1}{W_2}$ equals to



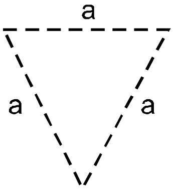
a) $\frac{m_1}{m_2}$ **b)** $\frac{m_2}{m_1}$ **c)** $\left(\frac{m_1}{m_2}\right)^2$ **d)** $\left(\frac{m_2}{m_1}\right)^2$

Q16 The position vector of the centre of mass $\vec{r}_{cm}$ of an asymmetric uniform bar of negligible area of cross-section as shown in figure is



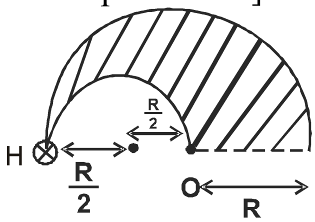
a) $\vec{r}_{cm} = \frac{5}{8}L\hat{x} + \frac{13}{8}L\hat{y}$ **b)** $\vec{r}_{cm} = \frac{3}{8}L\hat{x} + \frac{11}{8}L\hat{y}$ **c)** $\vec{r}_{cm} = \frac{13}{8}L\hat{x} + \frac{5}{8}L\hat{y}$ **d)** $\vec{r}_{cm} = \frac{11}{8}L\hat{x} + \frac{3}{8}L\hat{y}$

Q17 All sides of an equilateral triangle are diameter of three identical uniform semicircular rings each of mass m. Plane of each ring is perpendicular to the plane of paper. Then moment of inertia of this system of three semicircular rings about an axis through centroid of triangle and perpendicular to plane of paper is :



a) $\frac{5ma^2}{24}$ b) $\frac{5ma^2}{16}$ c) $\frac{5ma^2}{8}$ d) $\frac{5ma^2}{6}$

Q18 A uniform circular plate of radius R, from which a semicircular portion of radius $\frac{R}{2}$ is removed, shown in figure. The moment of inertia about an axis passing through its end 'H' and perpendicular to the plane of plate is [Assume mass of remaining portion of the plate is m]



a) $\frac{13}{8}mR^2$ b) $\frac{15}{8}mR^2$ c) $\frac{3}{8}mR^2$ d) $\frac{mR^2}{8}$

Q19 A certain spring is found not to obey Hooke's law, it exerts a restoring force $F(x) = -\alpha x - \beta x^2$ if it is stretched or compressed, where $\alpha = 48$ N/m and $\beta = 24$ N/m^2. The mass of the spring is negligible. An object with mass 1 kg on a frictionless, horizontal surface is attached to the spring, pulled a distance 1m to the right to stretch the spring and released. The speed of the object when it is 0.5m to the right of the x = 0 equilibrium position is

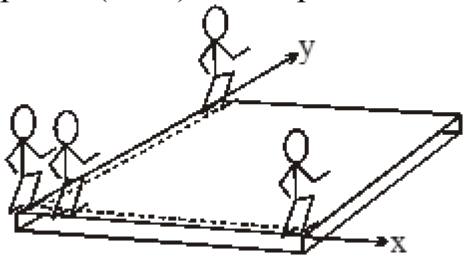
a) $\frac{5 m/s}{\sqrt{2}}$ b) 5 m/s c) $5\sqrt{2}$ m/s d) 10 m/s

Q20 The minimum work done by external agent in moving a particle from a point (1,1) to (2,3) in a plane and in a force field with potential energy $U = \lambda(x + y)$ is :

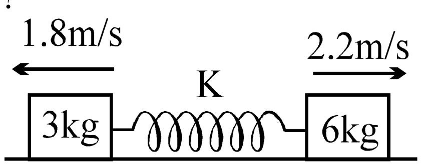
a) 3λ b) -3λ c) λ d) 0

Numerical

Q21 A square plank of mass $m_1 = 100$ kg and edge length $L = 20\sqrt{2}$ m is placed on a smooth surface. Two person each of mass $m_2 = m_3 = 50$ kg are at corner of a plank as shown in figure. Two person begin to walk on the plank along two different paths as shown in figure and reach nearest corners. What is magnitude of displacement of plank (in m) in the process.

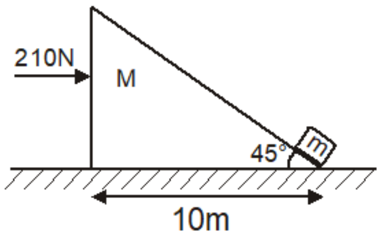


Q22 Two blocks A & B are connected by a spring of stiffness 512 N/m and placed on a smooth horizontal surface. Initially the spring has its equilibrium length. The indicated velocities are imparted to A & B. Find the maximum extension in the spring ?

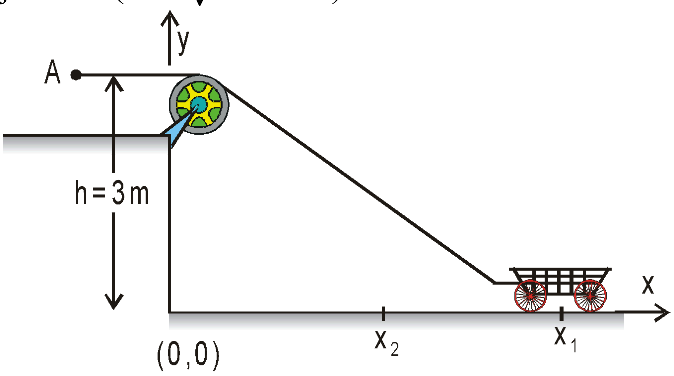


Q23 A particle is projected from ground with an initial velocity 20 m/sec making an angle 60° with horizontal. If R_1 and R_2 are radius of curvatures of the particle at point of projection and highest point respectively, then find the value of $\frac{R_1}{R_2}$.

Q24 A small block of mass m = 2kg is kept at rest the bottom of the incline plane of a wedge of mass M = 9 Kg. A force of 210 N is applied on the wedge horizontally as shown in diagram. All the surfaces are smooth. Determine the time taken in seconds by the mass m to reach the highest point of the incline plane of the wedge? {g = 10m/s^2)



Q25 Figure shows a light, inextensible string attached to a cart that can slide along a frictionless horizontal rail aligned along an x axis. The left end of the string is pulled over a small pulley, of negligible mass and friction and fixed at height h = 3m from the ground level. The cart slides from $x_1 = 3\sqrt{3}$ m to $x_2 = 4$ m and during the move, tension in the string is kept constant 50 N. Find change in kinetic energy of the cart in joules. (Use $\sqrt{3} = 1.7$)



Q26 A block slides down a 53° incline in twice the time it would take to slide down a frictionless 53° incline, covering same distances in both. Find coefficient of kinetic friction between the block and the incline and express your answer in multiple of 10^{-2}.

Q27 A river of width 100 m is flowing with a velocity of 1.5 m/s. A man start from one end with rest relative the river. He raws with an acceleration of 2 m/s^2 relative to the river. If the man want to cross the river in minimum time, by how much distance (in meters) will he be drifted (flown) in the direction of river flow during the crossing.

Q28 A particle moves along a circle with constant speed such that magnitude of its instantaneous acceleration is a. The magnitude of average acceleration during the time it covers half cycle is $\frac{n}{\pi}$a. Find the value of n.

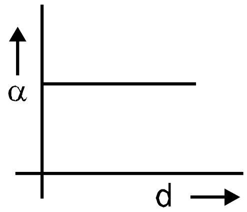
Q29 A particle is moving in x–y plane. At certain instant of time the velocity of particle is $8\hat{i}+6\hat{j}$ m/s and its acceleration is $10\hat{i}+20\hat{j}$ m/s^2. Find the rate of change of speed in m/s^2 at this instant.

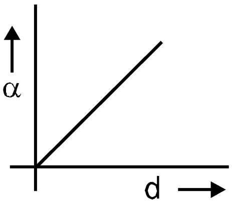
Q30 A particle moves along the curve $y^2 = 2x$ where $x = \frac{t^2}{2}$ (x & y are in meters), (t is time in sec). Then the magnitude of the acceleration of the particle at $t = 2$ sec (in m/s^2) is

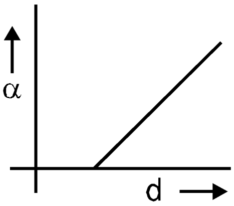
Chemistry

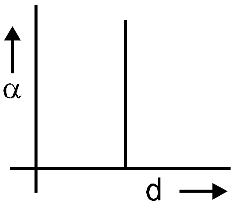
Single Choice Question

Q31 $C(s) \rightleftharpoons 2A(g) + B(s)$
If the dissociation of C(s) is 'α' and d is the density of the gaseous mixture in the container. Initially container have only 'C(s)' and the reaction is carried at constant temperature and pressure.

a) 

b) 

c) 

d) 

Q32 The number of S-S bonds in sulphur trioxide trimer (S_3O_9) is :
a) 3 **b)** 0 **c)** 1 **d)** 2

Q33 An ionic compound $A^+ B^-$ is most likely to be formed when -
a) Ionization energy of A is low **b)** Electron affinity of B is high
c) Electron affinity of B is low **d)** Both (A) and (B)

Q34 The bonds present in N_2O_5 are :
a) Only ionic **b)** Covalent & coordinate **c)** Only covalent **d)** Covalent & ionic

Q35 The hybrid states of central atom in diaborane, diamond and graphite are respectively :
a) sp^2, sp^3, sp^2 **b)** sp^3, sp^3, sp^2 **c)** sp^3, sp^3, sp^3 **d)** sp, sp^2, sp^3

Q36 4gm NaOH is dissolved in 18gm H_2O. Mole fraction of NaOH in solution and molality of the solution respectively are :
a) 0.09, 5.55 **b)** 0.06, 4.55 **c)** 0.02, 5.55 **d)** 0.08, 5.55

Q37 At very low pressure the compressibility factor of 1 mole of gas is given by.
a) 1 **b)** $1+\frac{Pb}{RT}$ **c)** $1-\frac{b}{VRT}$ **d)** $1-\frac{Pb}{RT}$

Q38 At 373 K and 1 atm, if the density of liquid water is 1.0 g/ml and that of water vapour is 0.0006 g/ml, then the volume ccupied by water molecules in 1 litre of steam at that temperature is
a) 6 ml **b)** 60 ml **c)** 0.6 ml **d)** 0.06 ml

Q39 K_p of N_2O_4 and NO_2 at 1 atm and 384 K is 0.5 atm. Density of equilibrium mixture of the following reaction is :
$N_2O_4 \rightleftharpoons 2NO_2$
a) 2.54 g/dm^3 **b)** 2.18 g/dm^3 **c)** 3.87 g/dm^3 **d)** 6.5 g/dm^3

Q40 The decrease of pressure on ice ⇌ water system at constant temperature will lead to :

a) a decrease in the entropy of the system

b) an increase in the Gibbs energy of the system **c)** no effect on the equilibrium

d) a shift of the equilibrium in the backward direction

Q41 Lucas reagent reacts fastest with :

a) butanol–1 **b)** butanol–2 **c)** 2–methyl–propanol–2 **d)** 2–methyl–propanol–1

Q42 Which of the following reagent is used to distinguish phenol and benzoic acid ?

a) Aqueous NaOH **b)** Tollen's reagent **c)** Molisch reagent **d)** Neutral $FeCl_3$

Q43 For the reaction (1) and (2)

$A(g) \rightleftharpoons B(g) + C(g)$ ....(1)

$X(g) \rightleftharpoons 2Y(g)$ ....(2)

Given, $K_{P_1} : K_{P_2} = 9 : 1$.

If the degree of dissociation of A(g) and X(g) be same then the total pressure at equilibrium (1) and (2) are in the ratio :

a) 3 : 1 **b)** 36 : 1 **c)** 1 : 1 **d)** 0.5 : 1

Q44 $Fe_2O_3(s)$ may be converted to Fe by the reaction

$Fe_2O_3(s) + 3H_2(g) \rightleftharpoons 2Fe(s) + 3H_2O(g)$,

for which $K_c = 8$ at temp. 720ºC.

What percent of the H_2 remains unreached after the reaction has come to equilibrium?

a) $\approx 22\%$ **b)** $\approx 34\%$ **c)** $\approx 66\%$ **d)** $\approx 78\%$

Q45 Pure PCl_5 is introduced into an evacuated chamber and comes to equilibrium at 247°C and 2.0 atm. The equilibrium gaseous mixture contains 40% chlorine by volume. Calculate Kp at 247°C for the reaction

$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

a) 0.625 atm **b)** 4 atm **c)** 1.6 atm **d)** None of these

Q46 $CH_2 = CH - CH = CH - CH_3 \xrightarrow[Zn, H_2O]{O_3}$ Products. Which product is not obtained in the above reaction ?

a) $CH_2 = O$ **b)** $CH_3 - CH=O$ **c)** OHC–CHO **d)** CH_3–COOH

Q47 Acetaldehyde and benzaldehyde can be differenitated by :

(a) Fehling test

(b) Iodoform test

(c) Tollen's reagent

(d) 2,4-DNP test

a) a & b **b)** a & c **c)** b & c **d)** c & d

Q48 Which statement is **incorrect** about pyrosilicate ion.

a) sp^3 hybridisation **b)** One oxygen atom is shared between two tetrahydron

c) there are eight Si–O bond **d)** There is one Si-Si bond

Q49 Electron gain enthalpy of first element in the following pairs is higher ?

a) F, Cl **b)** Se, O **c)** O, F **d)** S, Cl

Q50 Calculate value of $\frac{x+y+z}{10}$, here X is O–N–O bond angle in NO_3^- Y is O–N–O bond angle in NO_2^+ and Z is F–Xe–F adjacent bond angle in XeF_4.

a) 27 **b)** 32 **c)** 39 **d)** 43

Numerical

Q51 A simplified application of MO theory to the hypothetical ‘molecule’ OF would give its bond order as :
(Answer to be round off to nearest integer)

Q52 For Li^{+2} ion, number of degenerate state in n=3 ?

Q53 If the percentage yield of given reaction is 40%, how many total moles of the gases will be produced, if 8 moles of $NaNO_3$ are taken initially

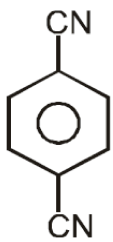
$NaNO_{3(s)} \xrightarrow{\Delta} Na_2O_{(s)} + N_2 + O_2$

(Answer to be round off to nearest integer)

Q54 The Van der Waals constants *a* and *b* for a gas of molar mass 164.2 g/mol are 4.105 atm-L^2/mol^2 and 0.1 L/mol, respectively. The density (in kg/m^3) of the gas at 2 atm and 500 K is

Q55 A bond X–Y has a dipole moment of 1.8×10^{-29} Cm and a bond length 150 pm. What will be the percentage of ionic character is given bond.

Q56 Number of non-polar molecule among the following is X and number of planar molecule is Y. Give X×Y.

BF_3, CO_2, SO_2, PCl_5, ClF_3, NH_3, SF_4, 

Q57 The electron gain enthalpy of a hypothetical element ‘A’ is –3 eV per atom. How much energy in kCal is released when 10 g of ‘A’ are completely converted to A^- ions in gaseous state ?
(Take : 1 eV per atom = 23 kCal mol^{-1}, Molar mass of A = 30 g)

Q58 In IF_6^- and TeF_5^-, sum of axial d–orbitals which are used in hybridisation in both species.

Q59 For an H-like atom

$\psi_{(r)} = k_1 r\,[K^2 r^2 + k_3 r + k_4].\ e - \frac{zr}{4a_0}$

$\Rightarrow K_1 r[K_2 r^2 + k_3 r + k_4].\ e^{\frac{-Zr}{4a_0}}$

Find the maximum value of n + ℓ + m for
The orbital, if k_1, k_2, k_3, k_4 & a_0 are constants

Q60 Calculate the value of "x + y – z' here x, y and z are total number of non- bonded electron pair (s), pie (π) bond (s) and sigma (σ) bonds in hydrogen phosphite ion respectively.

Mathematics

Single Choice Question

Q61 If $x_1, x_2, \ldots, x_{10}$ are 10 observations, such that $\sum_{i=1}^{5} x_i^2 = 40$, $\sum_{j=6}^{10} x_j^2 = 20$ and mean of $x_1, x_2, \ldots, x_5$ is 1, mean of $x_6, x_7, \ldots, x_{10}$ is 2, then the variance of $x_1, x_2, x_3, \ldots, x_{10}$ will be

a) $\frac{11}{4}$ b) $\frac{13}{4}$ c) $\frac{7}{2}$ d) $\frac{15}{4}$

Q62 The sum of first n terms of the series $\frac{4}{2.3.4} + \frac{7}{3.4.5} + \frac{10}{4.5.6} + \frac{13}{5.6.7} + \ldots$ is

a) $\frac{5}{6} - \frac{2n+3}{n^2+5n+4}$ b) $\frac{6}{5} - \frac{2n+3}{n^2+5n+6}$ c) $\frac{6}{5} - \frac{2n+3}{n^2+5n+4}$ d) $\frac{5}{6} - \frac{3n+5}{n^2+5n+6}$

Q63 If p, q, r are 3 A.M.'S between a & b, then pqr = $\frac{15}{2}$ and if p', q', r' are 3 H.M.'s between a & b, then p'q'r' $\frac{18}{5}$ and a, b $\in$ N, then a + b equals

a) 3 b) 4 c) 5 d) 6

Q64 If $\alpha, \beta, \gamma, \delta$ are the smallest positive angles in ascending order whose sines are equal to k, then the value of $4sin\frac{\alpha}{2} + 3sin\frac{\beta}{2} + 2sin\frac{\gamma}{2} + sin\frac{\delta}{2}$ is equal to

a) $2\sqrt{1-k}$ b) $2\sqrt{k}$ c) $2\sqrt{1+k}$ d) $\sqrt{1+k}$

Q65 In a family, there are 8 men, 7 women and 5 children whose ages separately are 24, 20 and 6 years respectively. The mean age of the family is.

a) 17.1 years b) 18.1 years c) 19.1 years d) 18.5 years

Q66 If f(x) = $\sin^2$x, g(x) = $\sqrt{x}$ and h(x) = $\cos^{-1}$x, 0 $\leq$ x $\leq$ 1, then -

a) hogof(x) = gofoh(x) b) gofoh(x) = fohog(x) c) fohog(x) = hogof(x)

d) None of these

Q67 Let f(x) = log x and g(x) = $\frac{x^4-2x^3+3x^2-2x+2}{2x^2-2x+1}$. The domain of the composite function fog(x) is -

a) $(-\infty, \infty)$ b) $[0, \infty)$ c) $(0, \infty)$ d) $[1, \infty)$

Q68 If A = 2 $\tan^{-1}\left(2\sqrt{2}-1\right)$ and B=3$\sin^{-1}\frac{1}{3}$+ $\sin^{-1}\frac{3}{5}$, then

a) B < A < 105° b) 105° < B < A c) B < 105° < A d) 105° < A < B

Q69 If $\alpha \in \left(-\frac{3\pi}{2}, -\pi\right)$, then the value of $\tan^{-1}(\cot \alpha) - \cot^{-1}(\tan \alpha) + \sin^{-1}(\sin \alpha) + \cos^{-1}(\cos \alpha)$ is equal to -

a) $2\pi + \alpha$ b) $\pi + \alpha$ c) 0 d) $\pi - \alpha$

Q70 If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{bmatrix}$, $I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $A^{-1} = \frac{1}{6}(A^2 + cA + d.I)$ then the values of c and d are respectively -

a) $-6, -11$ **b)** $6, 11$ **c)** $-6, 11$ **d)** None of these

Q71 Let $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ and $A' . A = I$, then the value of $x^2 + y^2 + z^2$ is -

a) 1 **b)** 2 **c)** $\frac{1}{2}$ **d)** None of these

Q72 If the system of equations, $a^2x - by = a^2 - b$ & $bx - b^2y = 2 + 4b$ possess no solution, then -

a) $a = 1, b = -1$ **b)** $a = 1, b = -2$ **c)** $a = -1, b = -1$ **d)** $a = -1, b = 2$

Q73 If $A = \begin{bmatrix} 0 & 5 \\ 0 & 0 \end{bmatrix}$ and $f(x) = 1 + x + x^2 + ... + x^{16}$, then f(A) is equal to -

a) 0 **b)** $\begin{bmatrix} 1 & 5 \\ 0 & 1 \end{bmatrix}$ **c)** $\begin{bmatrix} 1 & 5 \\ 0 & 0 \end{bmatrix}$ **d)** $\begin{bmatrix} 0 & 5 \\ 1 & 1 \end{bmatrix}$

Q74 If $A_r = \begin{pmatrix} r & r-1 \\ r-1 & r \end{pmatrix}$ where $r \in N$ then the value of $|A_1| + |A_2| + |A_3| + ...+ |A_{2006}|$ is -

a) 2006 **b)** $(2006)^2$ **c)** $(2006)^3$ **d)** 2007

Q75 $\left(\frac{2}{3}\right)^{x+2} = \left(\frac{3}{2}\right)^{2-2x}$ then x =

a) 1 **b)** 3 **c)** 4 **d)** 0

Q76 If $\log_5 a \log_a x = 2$ then x =

a) 125 **b)** a^2 **c)** 25 **d)** None

Q77 $3^{\log_9 49}$ equals -

a) 49 **b)** 7 **c)** 9 **d)** None

Q78 Let $f(x) = \log_e(\sqrt{x-3} + \sqrt{5-x})$, $x \in R$. Then domain of f(x) is -

a) $[3, 5]$ **b)** $[-\infty, 3] \cup [5, \infty)$ **c)** $\{3, 5\}$ **d)** None of these

Q79 If S is the set of all real x such that $\frac{2x-1}{2x^3+3x^2+x}$ is positive, then S contains -

a) $\left(-\frac{3}{2}, \frac{1}{2}\right)$ **b)** $\left(-\frac{3}{2}, \frac{1}{4}\right)$ **c)** $\left(-\frac{1}{4}, \frac{1}{2}\right)$ **d)** $\left(\frac{1}{2}, 3\right)$

Q80 Range of function f(x) = $\frac{x^2+2x+3}{x}$, x ∈ R is given by -

a) $[2-2\sqrt{3}, 2+2\sqrt{3}]$ **b)** $[2+2\sqrt{3}, \infty)$ **c)** $(-\infty, 2-2\sqrt{3}] \cup [2+2\sqrt{3}, \infty)$

d) None of these

Numerical

Q81 Absolute difference of greatest & least value of $\cos^{-1}x^2$, $\left(x \in \left[\frac{-1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right]\right)$ is $\frac{\pi}{k}$, then k = ––

Q82 The number of integral values of m for which the equation $|x^2 - 6|x| + 5| - m = 0$ has exactly four solution is k, then $\frac{11K}{2}$ equals (Answer to be roundoff to nearest integer)

Q83 If the value of $\log_2 5 - \sum_{k=1}^{4} \log_2\left(sin\frac{k\pi}{5}\right)$ is equal to $\frac{p}{q}$, where p and q are co-prime, then the value of $\frac{2p+q}{2}$ is equal to (Answer to be roundoff to nearest integer)

Q84 The value of t for which the following system is consistent x + y = 1, t x + y = t, (1 + t) x + 2y = 3, is

Q85 If A = $\begin{bmatrix} 1 & 3 & \lambda+2 \\ 2 & 4 & 8 \\ 3 & 5 & 10 \end{bmatrix}$ is a singular matrix then

λ = ...

Q86 If A is a square matrix of order 3 such that |A| = 2 then find the value of $|(\text{adj } A^{-1})^{-1}|$. (Answer to be roundoff to nearest Integer)

Q87 If f(x) = tan x and A, B, C are the angles of Δ then $\begin{vmatrix} f(A) & f(\pi/4) & f(\pi/4) \\ f(\pi/4) & f(B) & f(\pi/4) \\ f(\pi/4) & f(\pi/4) & f(C) \end{vmatrix}$ is equal to

Q88 If the system of linear equations

x + y + z = 5

x + 2y + 2z = 6

x + 3y + λz = μ, (λ, μ ∈ R), has infinitely many solutions, then the value of λ + μ is :

Q89 No. of integral values of 'a' if period of sin $[\sqrt{a}]$ x is $\frac{\pi}{2}$; [·] →greater integer function.

Q90 The number of integral values of k for which the line, 3x + 4y = k intersects the circle, $x^2 + y^2 - 2x - 4y + 4 = 0$ at two distinct points is______.

Answer Key

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**D**	**B**	**D**	**B**	**D**	**D**	**A**	**C**	**D**	**C**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**D**	**C**	**A**	**C**	**B**	**C**	**C**	**B**	**C**	**A**
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	**10**	**25**	**8**	**2**	**50**	**100**	**15**	**2**	**20**	**1**
Que.	31	32	33	34	35	36	37	38	39	40
Ans.	**D**	**B**	**D**	**B**	**B**	**A**	**A**	**C**	**B**	**D**
Que.	41	42	43	44	45	46	47	48	49	50
Ans.	**C**	**D**	**B**	**B**	**C**	**D**	**A**	**D**	**B**	**C**
Que.	51	52	53	54	55	56	57	58	59	60
Ans.	**2**	**9**	**6**	**8**	**75**	**20**	**23**	**4**	**6**	**3**
Que.	61	62	63	64	65	66	67	68	69	70
Ans.	**D**	**D**	**B**	**C**	**B**	**D**	**A**	**C**	**C**	**C**
Que.	71	72	73	74	75	76	77	78	79	80
Ans.	**A**	**D**	**B**	**B**	**C**	**C**	**B**	**A**	**D**	**C**
Que.	81	82	83	84	85	86	87	88	89	90
Ans.	**6**	**6**	**4**	**2**	**4**	**4**	**2**	**10**	**9**	**9**