



FULL TEST PAPER - 1

(JEE MAIN PATTERN)

FOR 11TH TO 12TH MOVING STUDENTS



PHYSICS

Section – I

Questions 1 to 20 are multiple choice questions. Each question has four choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct. Mark your response in OMR sheet against the question number of that question. + 4 marks will be given for each correct answer and – 1 mark for each wrong answer.

Q.1 A piece of wood has dimensions a, b and c. Its relative density is d. It is floating in water such that the side c is vertical. It is now pushed down gently and released. The time period is :

$$(1) T = 2\pi \sqrt{\left(\frac{abc}{g}\right)} \quad (2) T = 2\pi \sqrt{\left(\frac{ba}{dg}\right)}$$

$$(3) T = 2\pi \sqrt{\left(\frac{g}{dc}\right)} \quad (4) T = 2\pi \sqrt{\left(\frac{dc}{g}\right)}$$

Q.2 The amount of work done in blowing a soap bubble such that its diameter increases from d to D is (S = surface tension of solution)

$$(1) \pi (D^2 - d^2) S$$

$$(2) 2\pi (D^2 - d^2) S$$

$$(3) 4\pi (D^2 - d^2) S$$

$$(4) 8\pi (D^2 - d^2) S$$

Q.3 An observer standing at station observes frequency 219 Hz when a train approaches and 184 Hz when train goes away from him. If velocity of sound in air is 340 m/s, then velocity of train and actual frequency of whistle will be -

$$(1) 15.5 \text{ ms}^{-1}, 200 \text{ Hz}$$

$$(2) 19.5 \text{ ms}^{-1}, 205 \text{ Hz}$$

$$(3) 29.5 \text{ ms}^{-1}, 200 \text{ Hz}$$

$$(4) 32.5 \text{ ms}^{-1}, 205 \text{ Hz}$$

Q.4 An organ pipe P_1 is closed at one end and vibrating in the first overtone. Another pipe P_2 open at both the ends and vibrating in its third overtone is in resonance with the given tuning fork. The ratio of lengths of P_1 to that of P_2 is -

$$(1) 8/3 \quad (2) 3/8 \quad (3) 1/2 \quad (4) 1/3$$

Q.5 In an experiment, it was found that string vibrates in n loops, when a mass M is placed on the pan. What mass should be placed on the pan to make it vibrate in 2n loops with same frequency : (Neglect the mass of pan)

$$(1) 2M \quad (2) \frac{M}{4} \quad (3) 4M \quad (4) \frac{M}{2}$$

Q.6 The displacement 'y' of a particle executing periodic motion is given by –

$$y = 4 \cos^2 \frac{t}{2} \sin 1000 t$$

How many independent harmonic motions may be considered to superimpose to result this expression :

- (1) 2 (2) 3 (3) 4 (4) 1

Q.7 A kettle with 2 litre water at 27°C is heated by operating coil of power 1kW. The heat is lost to the atmosphere at constant rate 160 J/sec. In how much time will water be heated to 77°C-

- (1) 8 min. 20 sec (2) 6 min 2 sec
(3) 14 minute (4) 7 minute

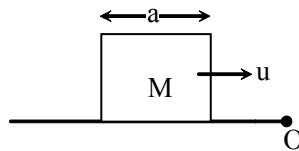
Q.8 A calorimeter contains 0.2 kg water at 30°C. 0.1 kg of water at 60°C is added to it, the mixture is well stirred and the resulting temperature is found to be 35°C. The thermal capacity of the calorimeter is -

- (1) 6300 J/K (2) 1260 J/K
(3) 4200 J/K (4) None

Q.9 A ball strikes a horizontal floor at 45° & 25% of its KE is lost in collision. Find the coefficient of restitution -

- (1) $\frac{1}{2}$ (2) $\frac{1}{\sqrt{2}}$ (3) $\frac{1}{2\sqrt{2}}$ (4) $\frac{1}{4}$

Q.10 A cubical block of side a moving with velocity v on a smooth horizontal surface. It hits a ridge at point O. The angular speed of the block after it hits at O is -



- (1) $\frac{3v}{4a}$ (2) $\frac{\sqrt{3}v}{\sqrt{2}a}$ (3) $\frac{v}{2a}$ (4) $\frac{1}{2} \sqrt{\frac{3v}{a}}$

Q.11 A mass m is moving with a constant velocity along a line parallel to x axis away from the origin. Its angular momentum with respect to origin -

- (1) remain constant
(2) zero
(3) Goes on increasing
(4) goes on decreasing

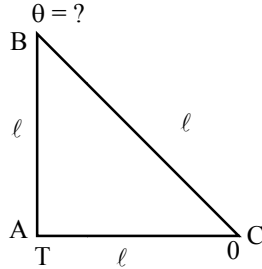
Q.12 If volume of a monoatomic gas suddenly becomes 8 times the temperature will becomes -

- (1) $\frac{T_1}{4}$ (2) $4T_1$ (3) $\frac{T_1}{32}$ (4) $32T_1$

Q.13 Ratio of radius of two sphere of same material are 1 : 2. Then ratio of rate of cooling at same temperature. -

- (1) 4 : 1 (2) 1 : 4 (3) 1 : 2 (4) 2 : 1

Q.14 Three rods of same material & same cross section are joined in form of a triangle. Then find temperature at point B -



- (1) $\frac{T\sqrt{2}}{\sqrt{2}+1}$ (2) $\frac{T}{2}$ (3) $\frac{T}{\sqrt{2}+1}$ (4) $\frac{T}{\sqrt{2}}$

Q.15 If air resistance is not considered in projectiles, the horizontal motion takes place with -

- (1) constant velocity
 (2) constant acceleration
 (3) constant retardation
 (4) variable velocity

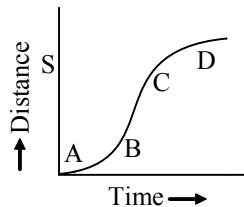
Q.16 A stone is thrown at an angle θ to the horizontal reaches a maximum height H. Then the time of flight of stone will be -

- (1) $\sqrt{\frac{2H}{g}}$ (2) $2\sqrt{\frac{2H}{g}}$
 (3) $\frac{2\sqrt{2H \sin \theta}}{g}$ (4) $\frac{\sqrt{2H \sin \theta}}{g}$

Q.17 A clock has seconds hand 10 cm long. The average velocity of tip of hand in 15 second is -

- (1) $\frac{\pi}{3}$ cm/s (2) zero
 (3) $\frac{\sqrt{2}\pi}{6}$ cm/s (4) $\frac{2\sqrt{2}}{3}$ cm/s

Q.18 A particle shows distance-time curve as given in this figure. The maximum instantaneous velocity of the particle is around the point-



- (1) D (2) A

- (3) B (4) C

Q.19 A block has been placed on an inclined plane. The slope angle θ of the plane is such that the block slides down the plane at a constant speed. The coefficient of kinetic friction is equal to :

- (1) $\sin\theta$ (2) $\cos\theta$
 (3) g (4) $\tan\theta$

Q.20 Two particles of equal masses are revolving in circular paths of radii r_1 and r_2 respectively with the same speed. The ratio of their centripetal force is :

- (1) r_2/r_1 (2) $\sqrt{r_2/r_1}$
 (3) $(r_1/r_2)^2$ (4) $(r_2/r_1)^2$

Section – II

This section contains **5 questions** (Q.21 to 25).+4 marks will be awarded for each correct answer and no negative marking for wrong answer. The answer to each question is a **single-digit integer**, ranging from 0 to 9. The bubble corresponding to the correct answer is to be darkened in the OMR.

Q.21 A loop and a disc roll without slipping with the same linear velocity 'v'. The mass of the loop and the disc is same. If the total kinetic energy of the loop is 8 J, find the kinetic energy of the disc (in J).

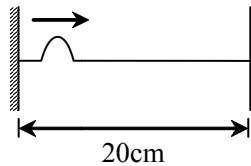
Q.22 Calculate the pressure (in 10^5N/m^2) exerted by a mixture of 8g of oxygen, 14 g of nitrogen and 22 g of carbon dioxide in a container of 30 ℓ at a temperature of 27°C .

Q.23 A travelling wave tube is given by

$$y = \frac{0.8}{(3x^2 + 12xt + 12t^2 + 4)}$$

where 'x' and 'y' are in metres and 't' is in seconds. Find the velocity in (m/s).

Q.24 A string of length 20 cm and linear mass density 0.40 g/cm is fixed at both ends and is kept under a tension of 16 N.A. wave pulse is produced at $t = 0$ near an end as shown in the figure and travels towards the other end.



Find the time (in $\times 10^{-2}$ s) when the string will have the shape shown in the figure again ?

Q.25 Two identical piano strings, when stretched with the same tension T_0 , have a fundamental frequency of 300 Hz. The tension in one of the strings is increased to $(T_0 + \Delta T)$ and 3 beats per second occur when both strings vibrate simultaneously. $(\Delta T/T_0) \times 100$ is equal to n . Find n .

CHEMISTRY

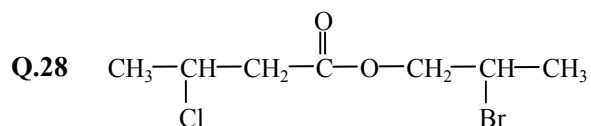
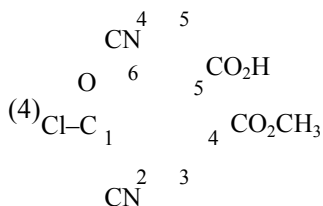
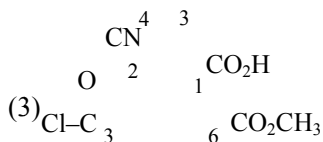
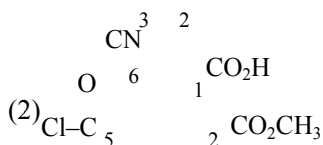
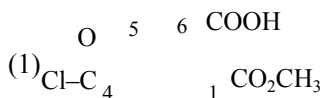
Section – I

Questions 26 to 45 are multiple choice questions. Each question has four choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct. Mark your response in OMR sheet against the question number of that question. + 4 marks will be given for each correct answer and – 1 mark for each wrong answer.

Q.26 The smog is essentially caused by the presence of :

- (1) Methyl isocyanate
- (2) Sodium arsenite
- (3) Oxide of N and S
- (4) All of the above

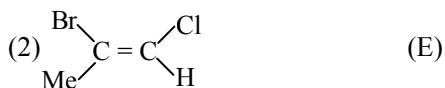
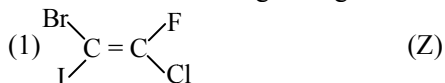
Q.27 Which of the following structures has the correct locants ?

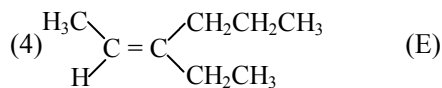
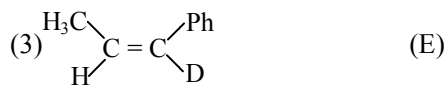


Select the correct IUPAC name among the following :

- (1) 3-chlorobutyl-2-bromopropanoate
- (2) 2-chlorobutyl-3-bromopropanoate
- (3) 2-bromopropyl-3-chlorobutanoate
- (4) β -bromopropyl-3-chlorobutyrate

Q.29 Which of the following configuration are correct

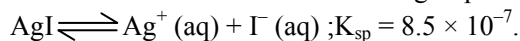




Q.30 Among the following substituted silanes the one which will give rise to cross-linked silicone polymer on hydrolysis is :

- (1) R_3SiCl (2) R_4Si
 (3) RSiCl_3 (4) R_2SiCl_2

Q.31 Silver iodide is used in cloud seeding to produce rain



AgNO_3 and KI are mixed to give $[\text{Ag}^+] = 0.010 \text{ M}$; $[\text{I}^-] = 0.015 \text{ M}$. Will AgI precipitate?

- (1) yes
 (2) no
 (3) can't say
 (4) this depends on $[\text{NO}_3^-]$ and $[\text{K}^+]$

Q.32 At high temperature and low pressure, the van der Waals' equation is reduced to :

- (1) $\left(P + \frac{a}{V^2}\right)V = RT$
 (2) $PV = RT$
 (3) $P(V - b) = RT$
 (4) $\left(P + \frac{a}{V^2}\right)(V - b) = RT$

Q.33 The constant 'a' in vander Waals' equation is maximum in :

- (1) He (2) H_2 (3) O_2 (4) NH_3

Q.34 For the reaction, $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$, the value of K_c at 800°C is 0.1. When the equilibrium concentration of both the reactants is 0.5 mol, what is the value of K_p at the same temperature?

- (1) 0.5 (2) 0.1 (3) 0.01 (4) 0.025

Q.35 $\text{F}_2\text{C} = \text{CF} - \text{CF} = \text{CF}_2 \longrightarrow \text{F}_2\text{C} - \text{CF}_2$



For this reaction (ring closure), $\Delta H = -49 \text{ kJ mol}^{-1}$, $\Delta S = -40.2 \text{ J K}^{-1}\text{mol}^{-1}$. Upto what temperature is the forward reaction spontaneous?

- (1) 1492°C (2) 1219°C
 (3) 946°C (4) 1080°C

Q.36 Arrange the following in increasing order of their atomic radii : Na, K, Mg, Rb ?

- (1) $\text{Mg} < \text{K} < \text{Na} < \text{Rb}$ (2) $\text{Mg} < \text{Na} < \text{K} < \text{Rb}$
 (3) $\text{Mg} < \text{Na} < \text{Rb} < \text{K}$ (4) $\text{Na} < \text{K} < \text{Rb} < \text{Mg}$

Q.37 Which of the following statement is correct ?

- (1) FeCl_2 is more covalent than FeCl_3
 (2) FeCl_3 is more covalent than FeCl_2

- (3) Both FeCl_2 and FeCl_3 are equally covalent
 (4) FeCl_2 and FeCl_3 do not have any covalent character
- Q.38** The correct order of increasing covalent character of the following is :
 (1) $\text{SiCl}_4 < \text{AlCl}_3 < \text{CaCl}_2 < \text{KCl}$
 (2) $\text{KCl} < \text{CaCl}_2 < \text{AlCl}_3 < \text{SiCl}_4$
 (3) $\text{AlCl}_3 < \text{CaCl}_2 < \text{KCl} < \text{SiCl}_4$
 (4) none of these
- Q.39** Alcohol dissolves :
 (1) KCl (2) NaCl (3) RbCl (4) LiCl
- Q.40** In the following reaction

$$\text{NO}_2^- + \text{H}_2\text{O} \longrightarrow \text{NO}_3^- + 2\text{H}^+ + n\text{e}^-$$
 What is the value of n :
 (1) 2 (2) 3 (3) 4 (4) 6
- Q.41** When methane burnt in oxygen to produce CO_2 and H_2O . The change in oxidation number of carbon will be :
 (1) 4 (2) 8 (3) 2 (4) zero
- Q.42** The number of moles of Sn^{+2} ion oxidise by 1 mole of $\text{K}_2\text{Cr}_2\text{O}_7$ in acidic medium will be :
 (1) 1.5 (2) 2 (3) 3 (4) 0.5
- Q.43** The orbital angular momentum of an electron in 2s-orbital is :
 (1) $+\frac{1}{2} \cdot \frac{h}{2\pi}$ (2) zero (3) $\frac{h}{2\pi}$ (4) $\sqrt{2} \cdot \frac{h}{2\pi}$
- Q.44** 0.56 g of a gas occupies 280 cm^3 at NTP, then its molecular mass is :
 (1) 4.8 (2) 44.8
 (3) 2 (4) 22.4
- Q.45** The mass of CO_2 obtained when 60 g of calcium carbonate is treated with excess of hydrochloric acid is :
 (1) 30.0 g (2) 15.0 g
 (3) 13.2 g (4) 26.4 g

Section – II

This section contains **5 questions** (Q.46 to 50). +4 marks will be awarded for each correct answer and no negative marking for wrong answer. The answer to each question is a **single-digit integer**, ranging from 0 to 9. The bubble corresponding to the correct answer is to be darkened in the OMR.

- Q.46** Two hydrogen atoms are moving towards each other with velocity $3.5 \times 10^4 \text{ m/sec}$. They collide and come to rest. Due to collision one of these hydrogen atom is found to get excited to some higher state.

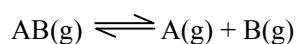
If electron of hydrogen atom moves to n^{th} orbit, then find value of n (Assume mass of hydrogen atom = 1.6×10^{-27} Kg)

Q.47 One mole of N_2H_4 loses ten moles of electrons to form a new compound Y. Assuming that all the nitrogen appears in the new compound, what is the oxidation state of nitrogen in Y ? (There is no change in the oxidation state of hydrogen.)

Q.48 0.7 g of a sample of $\text{Na}_2\text{CO}_3 \cdot x\text{H}_2\text{O}$ were dissolved in water and the volume was made to 100 ml. 20 ml of this solution required 19.8 ml of N/10 HCl for complete neutralization. The value of x is.

Q.49 A gaseous alkane ($\text{C}_n\text{H}_{2n+2}$) is exploded with oxygen. The volume of O_2 used and CO_2 formed are in the ratio of 7 : 4. Deduce the value of n .

Q.50 For the reaction :



AB is 33% dissociated at a total pressure of p . Then, $\frac{p}{K_p}$ will be equal to.

MATHS

Section – I

Questions 51 to 70 are multiple choice questions. Each question has four choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct. Mark your response in OMR sheet against the question number of that question. + 4 marks will be given for each correct answer and – 1 mark for each wrong answer.

Q.51 The equation of the line which makes right angled triangle with axes whose area is 6 sq. units and whose hypotenuse is of 5 units, is -

(1) $\frac{x}{4} + \frac{y}{3} = \pm 1$ (2) $\frac{x}{4} - \frac{y}{3} = \pm 3$

(3) $\frac{x}{6} + \frac{y}{1} = \pm 1$ (4) $\frac{x}{1} - \frac{y}{6} = \pm 1$

Q.52 The equation of the bisector of that angle between the lines $x + 2y - 11 = 0$, $3x - 6y - 5 = 0$ which contains the point $(1, -3)$ is -

(1) $3x = 19$

(2) $3y = 7$

(3) $3x = 19$ and $3y = 7$

(4) None of these

Q.53 The locus of the point of intersection of the tangents at the extremities of a chord of the circle $x^2 + y^2 = a^2$ which touches the circle $x^2 + y^2 = 2ax$ is -

(1) $y^2 = a(a - 2x)$ (2) $x^2 = a(a - 2y)$

(3) $x^2 + y^2 = (y - a)^2$ (4) none of these

Q.54 Two parabolas have the same focus. If their directrices are the x-axis & y-axis, respectively, then the slope of their common chord is -

(1) ± 1 (2) $\frac{4}{3}$

(3) $\frac{3}{4}$ (4) none of these

Q.55 Two straight lines are perpendicular to each other. One of them touches the parabola $y^2 = 4a(x + a)$ and the other touches $y^2 = 4b(x + b)$. Their point of intersection lies on the line -

(1) $x - a + b = 0$ (2) $x + a - b = 0$

(3) $x + a + b = 0$ (4) $x - a - b = 0$

Q.56 If $y = 2x - 3$ is a tangent to the parabola $y^2 = 4a\left(x - \frac{1}{3}\right)$, then 'a' is equal to -

- (1) $\frac{22}{3}$ (2) -1 (3) $\frac{14}{3}$ (4) $\frac{-14}{3}$

Q.57 A line of fixed length $a + b$ moves so that its ends are always on two fixed perpendicular straight lines, then the locus of a point, which divides this line into portions of lengths a and b is a/an -

- (1) ellipse (2) parabola
(3) straight line (4) none of these

Q.58 Let LL' be the latusrectum through the focus of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and A' be the farther vertex. If $\Delta A'LL'$ is equilateral, then the eccentricity of the hyperbola is (axes are coordinate axes) -

- (1) $\sqrt{3}$ (2) $\sqrt{3} + 1$
(3) $\frac{\sqrt{3} + 1}{\sqrt{2}}$ (4) $\frac{\sqrt{3} + 1}{\sqrt{3}}$

Q.59 If $\sin\theta + \operatorname{cosec}\theta = 2$ then $\sin^n\theta + \operatorname{cosec}^n\theta$ is equal to -

- (1) 1 (2) 3
(3) 2 (4) None of these

Q.60 If $\tan\theta \tan(120^\circ - \theta) \tan(120^\circ + \theta) = \frac{1}{\sqrt{3}}$ then θ is equal to -

- (1) $\frac{n\pi}{3} - \frac{\pi}{2}, n \in \mathbb{Z}$ (2) $\frac{n\pi}{3} - \frac{\pi}{18}, n \in \mathbb{Z}$
(3) $\frac{n\pi}{3} + \frac{\pi}{18}, n \in \mathbb{Z}$ (4) $\frac{n\pi}{3} + \frac{\pi}{12}, n \in \mathbb{Z}$

Q.61 The most general values of θ satisfying

$2\cos\theta + \sqrt{3} = 0$ and $\sqrt{3} \tan\theta - 1 = 0$ are given by

- (1) $n\pi \pm \frac{\pi}{6}, n \in \mathbb{Z}$ (2) $2n\pi \pm \frac{\pi}{6}, n \in \mathbb{Z}$
(3) $2n\pi + \frac{7\pi}{6}, n \in \mathbb{Z}$ (4) None of these

Q.62 Two angles of a triangle are $\cot^{-1}2$ and $\cot^{-1}3$, then the third angle are -

- (1) $\frac{\pi}{4}$ (2) $\frac{3\pi}{4}$
(3) $\frac{\pi}{6}$ (4) $\frac{\pi}{3}$

- Q.63** If $y \in (-\pi, \pi)$ then the total number of ordered pairs (x, y) satisfying the equation $\sec^2(x+2)y + x^2 - 1 = 0$ is -
- (1) 2 (2) 1
(3) 3 (4) infinite
- Q.64** In a town of 10000 families it was found that 40% families buy newspaper A, 20% families buy newspaper B and 10% families buy newspaper C, 5% families buy A and B, 3% buy B and C and 4% buy A and C. and C. If 2% families buy all the three newspapers. Then of families which buy A only is :
- (1) 3100 (2) 3300
(3) 2900 (4) 1400
- Q.65** In a triangle PQR, $\angle R = \frac{\pi}{2}$. If $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ are the roots of $ax^2 + bx + c = 0$, $a \neq 0$, then
- (1) $b = a + c$ (2) $b = c$
(3) $c = a + b$ (4) $a = b + c$
- Q.66** If $\alpha \neq \beta$, but $\alpha^2 = 5\alpha - 3$ and $\beta^2 = 5\beta - 3$ then the equation whose roots are α / β and β / α is :
- (1) $3x^2 - 25x + 3 = 0$ (2) $x^2 + 5x - 3 = 0$
(3) $x^2 - 5x + 3 = 0$ (4) $3x^2 - 19x + 3 = 0$
- Q.67** The test marks in statistics for class are 20, 24, 27, 38, 18, 42, 35, 21, 44, 18, 31, 36, 41, 26, 29. the median score of the class is -
- (1) 8 (2) 21 (3) 29 (4) 31
- Q.68** If $(ax^3 + bx^2 + cx + d)$ is divisible by $(ax^2 + c)$, then a, b, c, d are in :
- (1) AP (2) GP
(3) HP (4) None
- Q.69** If (a, b) , (c, d) , (e, f) are vertices of a triangle, such that a, c, e are in GP with common ratio 'r' & b, d, f are in GP with common ratio 's', then the area of the triangle is :
- (1) $\left| \frac{1}{2} ab (r-s) (1+r) (1+s) \right|$
(2) $\left| \frac{1}{2} ab (s-r) (r-1) (s-1) \right|$
(3) $\left| \frac{1}{2} abrs^2 \right|$
(4) none
- Q.70** In a certain test, there are 'n' questions. In this test 2^k students gave wrong answers to atleast $(n - k)$ questions, where $k = 0, 1, 2, \dots, n$. If total number of wrong answers is 4095, then value of n is
- (1) 11 (2) 10
(3) 13 (4) none

Section – II

This section contains **5 questions** (Q.71 to 75). **4** marks will be awarded for each correct answer and no negative marking for wrong answer. The answer to each question is a **single-digit integer**, ranging from 0 to 9. The bubble corresponding to the correct answer is to be darkened in the OMR.

- Q.71** If the tangent at any point of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ makes an angle α with the major axis and an angle β with the focal radius of the point of contact then the eccentricity of the ellipse is given by $e = \left(\frac{\cos \beta}{\cos \alpha} \right) \frac{\lambda}{5}$. Find λ .
- Q.72** The maximum value of $1 + \sin\left(\frac{\pi}{4} + \theta\right) + 2\cos\left(\frac{\pi}{4} - \theta\right)$ for real value of θ is
- Q.73** If α is the smallest positive solution of the equation $\sqrt{\sin(1-x)} = \sqrt{\cos x}$, then $4\alpha - 7\pi$ is equal to ...
- Q.74** If $f(x) = 27x^3 + \frac{1}{x^3}$ and α, β are the roots of $3x + \frac{1}{x} = 2$, then $-f(\alpha)/10$ is equal to
- Q.75** Tangents are drawn to the circle $x^2 + y^2 = 12$ at the points, where it is met by the circle $x^2 + y^2 - 5x + 3y - 2 = 0$, then the x -coordinate of the point of intersection of these tangents is