NEW STANDARD ACADEMY

Test Type : Unit Test - 04

Do not open this Test Booklet until you are asked to do so.   **11-09-2023**

JEE(MAIN): 11th Undergoing Students

Read carefully the Instructions on the Back Cover of this Test Booklet.

Important Instructions :

1. Immediately fill in the form number on this page of the Test Booklet with Blue/Black Ball Point Pen. Use of pencil is strictly prohibited.

2. The candidates should not write their Form Number anywhere else (except in the specified space) on the Test Booklet/Answer Sheet.

3. The Test Booklet consists of 90 questions.

4. There are three parts in the question paper 1,2,3 consisting of Physics, Chemistry and Mathematics having 30 questions in each subject and each subject having Two sections. (i) Section-I contains 20 multiple choice questions with only one correct option. Marking scheme : +4 for correct answer, 0 if not attempted and –1 in all other cases. (ii) Section-II contains 10 Numerical Value Type questions. Attempt any 5 questions. First 5 attempted questions will be considered for marking. Marking scheme : +4 for correct answer, 0 if not attempted and –1 in all other cases.

5. Use Blue/Black Ball Point Pen only for writting particulars/marking responses on Side –1 and Side–2 of the Answer Sheet. Use of pencil is strictly prohibited.

6. No candidate is allowed to carry any textual material, printed or written, bits of papers, mobile phone any electronic device etc, except the Identity Card inside the examination hall/room.

7. Rough work is to be done on the space provided for this purpose in the Test Booklet only.

8. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator on duty in the Room/ Hall. However, the candidate are allowed to take away this Test Booklet with them.

Name of the Candidate(In Capitals) _____

Date of Examintation _____

Candidate`s Signature:_____     Invigilator`s Signature: _____

PART-1 : PHYSICS

SECTION-I : (Maximum Marks: 80)

This section contains **20 questions**. Each question has 4 options for correct answer. Multiple-Choice Questions (MCQs) **Only one option is correct**. For each question, marks will be awarded as follows:

Full Marks : +4 If correct answer is selected.
Zero Marks : 0 If none of the option is selected.
*Negative Marks* : −1 If wrong option is selected.

1. A grinding wheel attained a angular velocity of 20 rad/sec in 5 sec starting from rest. Find the number of revolutions made by the wheel :-

   (A) $\dfrac{\pi}{25}$ revolution
   (B) $\dfrac{1}{\pi}$ revolution
   (C) $\dfrac{25}{\pi}$ revolution
   (D) None

2. A particle is moving in a horizontal circle with constant speed. State whether, the :-
   (A) K.E. is constant
   (B) P.E. is constant
   (C) Both K.E. and P.E. are constant
   (D) Both K.E. and P.E. are not constant

3. A conical pendulum is moving in a circle with angular velocity ω as shown. If tension in the string is T, which of following equations are correct ?
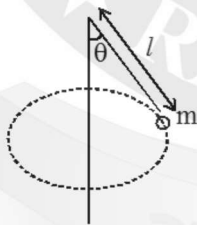

   (A) $T = m\omega^2 l$
   (B) $T \sin\theta = m\omega^2 l$
   (C) $T = mg\cos\theta$
   (D) $T = m\omega^2 l \sin\theta$

4. A car is travelling with linear velocity v on a circular road of radius r. If it is increasing its speed at the rate of a metre/sec^2, then the resultant acceleration will be :-

   (A) $\sqrt{\left(\dfrac{v^2}{r^2} - a^2\right)}$
   (B) $\sqrt{\left(\dfrac{v^4}{r^2} + a^2\right)}$
   (C) $\sqrt{\left(\dfrac{v^4}{r^2} - a^2\right)}$
   (D) $\sqrt{\left(\dfrac{v^2}{r^2} + a^2\right)}$

5. A pendulum bob is swinging in a vertical plane such that its angular amplitude is less than 90°. At its highest point, the string is cut. Which trajectory is possible for the bob afterwards :-
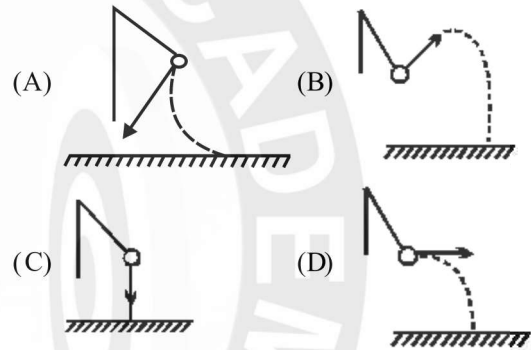
6. Two bodies of mass 10 kg and 5 kg moving in concentric orbits of radii R and r such that their periods are the same. Then the ratio between their centripetal acceleration is

   (A) R/r
   (B) r/R
   (C) R^2/r^2
   (D) r^2/R^2

7. A mass is supported on a frictionless horizontal surface. It is attached to a string and rotates about a fixed centre at an angular velocity ω_0. If the length of the string and angular velocity both are doubled, the tension in the string which was initially T_0 is now :

   (A) T_0
   (B) $T_0 / 2$
   (C) $4T_0$
   (D) $8T_0$

Space for Rough Work

8. A car of mass m when passes over a convex bridge of radius of curvature r, with a velocity v, then the normal force exerted by the bridge on the car is :-

(A) Zero

(B) mg

(C) $mg + \dfrac{mv^2}{r}$

(D) $mg - \dfrac{mv^2}{r}$

9. An object is tied to a string of length ℓ and is revolved in a vertical circle at the minimum velocity. When the object reaches the upper most point, the string breaks and it describes a parabolic path as shown in the figure under the gravitational force. The horizontal range AC in the plane of A would be :-
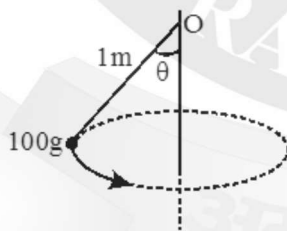

(A) x = ℓ

(B) x = 2ℓ
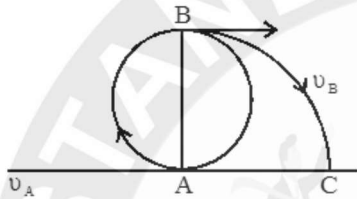
(C) x = $\sqrt{2}\ell$

(D) x = 2$\sqrt{2}\ell$

10. If linear velocity is constant then angular velocity is proportional to :

(A) r   (B) r^1 (C) r^{-2} (D) r^2

11. A string of length 1m is fixed at one end and carries a mass of 100 g at the other end. The string makes $(2/\pi)$ revolutions per second around vertical axis through the fixed end. What is the tension in the string :-

(A) 1.6 N   (B) 0.8 N   (C) 3.2 N   (D) 2.4 N

12. If a_r and a_t represents radial and tangential acceleration, the motion of a particle will be circular if :

(i) $a_r = 0$ and $a_t = 0$ (ii) $a_r = 0$ but $a_t \neq 0$

(iii) $a_r \neq 0$ but $a_t = 0$ (iv) $a_t \neq 0$ and $a_t \neq 0$

(A) (i, iii)

(B) (ii, iii)

(C) (iii, iv)

(D) (ii, iv)

13. A point moves along a circle with speed v = at. The total acceleration of the point at a time when it has traced 1/8th of the circumference is :

(A) $\dfrac{v}{8a}$

(B) $2a\sqrt{4 + \pi^2}$

(C) a

(D) $\dfrac{a}{2}\sqrt{4 + \pi^2}$

14. Railway tracks are banked at the curves so that :

(A) the train may not fall down inwards

(B) the weight of the train may be reduced

(C) the necessary centripetal force may be obtained from the horizontal component of the reaction of the train

(D) no frictional force may be produced between the wheel and the track

15. A mass of 2kg is whirled in a horizontal circle by means of a string at an initial speed of 5 rev/min. keeping the radius constant, the tension in the string is doubled. The new speed is nearly:-

(A) $\dfrac{5}{\sqrt{2}}$rev. / min

(B) 10 rev./min

(C) $10\sqrt{2}$ rev. / min

(D) $5\sqrt{2}$ rev. / min

Space for Rough Work

16. When the string of a conical pendulum makes an angle of 45° with the vertical its time period is T_1. When the string makes an angle of 60° with the vertical its time period is T_2. Then $\dfrac{T_1^2}{T_2^2}$ is :-

(A) $\sqrt{2}$

(B) $\sqrt{3}$

(C) $\sqrt{5}$

(D) $\sqrt{7}$

17. If a particle of mass m is moving in a horizontal circle of radius r with a centripetal force $(-k / r^2)$, the total energy is

(A) $-\dfrac{k}{2r}$

(B) $-\dfrac{k}{r}$

(C) $-\dfrac{2k}{r}$

(D) $-\dfrac{4k}{r}$

18. Two particles describe the same circle of radius R in the same direction with the same speed V. then at the given instant relative angular velocity of 2 with respect to 1 will be :-
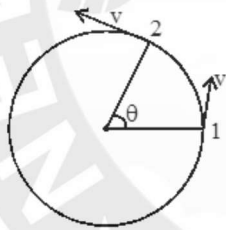
(A) $\dfrac{2v \ \sin \frac{\theta}{2}}{R}$

(B) $\dfrac{v}{2R \sin \frac{\theta}{2}}$

(C) $\dfrac{v}{R}$

(D) $\dfrac{v \cos \frac{\theta}{2}}{R}$

19. A 2 kg stone at the end of a string 1 m long is whirled in a vertical circle. At some point its speed is 4m/s. The tension of the string is 51.6 newton. At this instant the stone is :

(A) at the top of the circle

(B) at the bottom of the circle

(C) half way down

(D) None of these

20. For a particle in uniform circular motion, the acceleration $\vec{a}$ at a point $P(R,\theta)$ on the circle of radius R is (Here θ is measured from the x-axis) :

(A) $\dfrac{v^2}{R}\hat{i} + \dfrac{v^2}{R}\hat{j}$

(B) $\dfrac{v^2}{R}\cos\theta\,\hat{i} + \dfrac{v^2}{R}\sin\theta\,\hat{j}$

(C) $\dfrac{v^2}{R}\sin\theta\,\hat{i} + \dfrac{v^2}{R}\cos\theta\,\hat{j}$

(D) $\dfrac{v^2}{R}\cos\theta\,\hat{i} \ \dfrac{v^2}{R}\sin\theta\,\hat{j}$

Space for Rough Work

1. A road is banked at an angle of 30° to the horizontal for negotiating a curve of radius $10\sqrt{3}$ m. At what velocity (in km/h) will a car experience no friction while negotiating the curve?

2. A circular road of radius 1000 m has banking angle 45°. The maximum safe speed (in m/s) of a car having mass 2000 kg will be, if the coefficient of friction between tyre and road is 0.5 :

3. A particle is moving on a circular path of radius $\dfrac{100}{\sqrt{19}}$ m in such a way that magnitude of its velocity varies with time as $v = 2t^2 + t$, where v is velocity in m/s and t is time in s. The acceleration of the particle at t = 2s is (in m/s^2)

4. A particle is moving along a circular path with a constant speed of 10 ms^{-1}. What is the magnitude of the change is velocity (in m/s) of the particle, when it moves through an angle of 60° around the centre of the circle?

5. Concrete mixture is made by mixing cement, stone and sand in a rotating cylindrical drum. If the drum rotates too fast, the ingredients remain stuck to the wall of the drum and proper mixing of ingredients does not take place. The maximum rotational speed of the drum in revolutions per minute(rpm) to ensure proper mixing is close to : (Take the radius of the drum to be 1.25 m and its axle to be horizontal) :

6. A car moving at a speed of 54 km/hr can brought to rest by breaking in 75 m. If the same road is in shape of a horizontal circle of radius 6 meter, what can be it's maximum speed in (m/sec) so that it can negotiate the curve?

7. An airoplane is moving on a circular path with a uniform speed of 300 km/h. The charge in velocity (in km/h) after half the revolution is.

8. Particles A and B move with constant and equal speeds in a circle as shown, if the angular velocity of the particle A with respect to B is nω and if the angular velocity of particle A w.r.t. O is ω, then find the value of n.
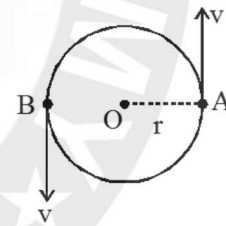
9. A particle is moving on a circular track of radius 30 cm with a constant speed of 6 m/s. Its tangential acceleration is :- (in m/s^2)

10. A wheel initiallly at rest starts moving about its axis with constant angular acceleration. In first 2sec. it rotates through angle θ_1 and in further 2 sec. it rotates through angle θ_2. The ratio θ_2/θ_1 is :-

Space for Rough Work

PART-2 : CHEMISTRY

SECTION-I : (Maximum Marks: 80)

This section contains **20 questions**. Each question has 4 options for correct answer. Multiple-Choice Questions (MCQs) **Only one option is correct**. For each question, marks will be awarded as follows:

Full Marks   : +4 If correct answer is selected.

Zero Marks   : 0 If none of the option is selected.

Negative Marks : −1 If wrong option is selected.

1. The oxidation number of phosphorus in $Ba(H_2PO_2)_2$ is :-

    (A) +3   (B) +2

    (C) +1   (D) −1

2. Ratio of number of oxygen atoms which show −1 and −2 oxidation states in the compound $H_2S_2O_8$ is

    (A) 1 : 1   (B) 1 : 3

    (C) 3 : 1   (D) None of these

3. The oxidation state of chromium in $Cr(CO)_6$ is :-

    (A) 0   (B) +2   (C) −2   (D) +6

4. The oxidation number of vanadium in vanadyl ions VO_2^{+2} and VO^{+2} are respectively :-

    (A) +6, +6

    (B) +6, +4

    (C) +4, +2

    (D) +4, +6

5. The oxidation state of S in $Na_2S_4O_6$ is :-

    (A) +2   (B) +6

    (C) 4   (D) + 2½

6. In the reaction

    $3Cl_2 + 6NaOH \longrightarrow NaClO_3 + 5NaCl + 3H_2O$

    the element which looses as well as gains electron is—

    (A) Na   (B) O

    (C) Cl   (D) None of these

7. Equivalent weight of FeS_2 in the half reaction $FeS_2 \longrightarrow Fe_2O_3 + SO_2$ is :-

    (A) M/10   (B) M/11

    (C) M/6   (D) M/1

8. x gm of the metal gave y gm of its oxide. Hence equivalent weight of the metal :

    (A) $\dfrac{y\ x}{x} \times 8$ (B) $\dfrac{x}{(y\ x)} \times 8$

    (C) $\dfrac{x}{y} \times 8$ (D) $\dfrac{x+y}{x} \times 8$

9. 1 mole of OH ion is obtained from 85 g of hydroxide of metal what is the equivalent weight of metal?

    (A) 85 g   (B) 84 g

    (C) 68 g   (D) 78 g

10. Equivalents of MnO_4 and $Cr_2O_7^{2}$ per mole of the ion in acidic medium are in the ratio of :-

    (A) 1 : 1   (B) 1 : 5

    (C) 5 : 6   (D) 6 : 1

11. Moles of MnO_4 ions required to oxidize 2 moles of Cu_2S in acidic medium according to given reaction,

    $Cu_2S \longrightarrow Cu^{2+} + SO_2$

    will be :

    (A) 3.2   (B) 2.4

    (C) 2.6   (D) 4.8

Space for Rough Work

12. $2KMnO_4 + 5H_2S + 6H^+ \rightarrow 2Mn^{2+} + 2K^+ + 5S + 8H_2O$.
In the above reaction, how many moles of electrons would be involved in the Reduction of 1 mole of oxidant ?

(A) Two   (B) Five

(C) Ten   (D) One

13. In the reaction ;
$As_2S_3 + HNO_3 \rightarrow H_3AsO_4 + H_2SO_4 + NO$,
the element oxidised is/are :-

(A) As only   (B) S only

(C) N only   (D) As and S both

14. Calculate the mass of anhydrous oxalic acid. Which can be oxidised to $CO_2(g)$ by 100 ml of an MnO_4^- solution, 10 ml of which is capable of oxidising 50 ml of 1 N I^- to I_2.

(A) 45 gm   (B) 22.5 gm

(C) 30 gm   (D) 12.25 gm

15. Find the number of moles of $KMnO_4$ needed to oxidise one mole Cu_2S in acidic medium.

The reaction : $KMnO_4 + Cu_2S \rightarrow Mn^{+2} + Cu^{+2} + SO_2$

(A) 1.9   (B) 2.1

(C) 1.6   (D) 3

16. How many moles of stannous oxalate can be oxidised into Sn^{+4} and CO_2 using 1 mole of $K_2Cr_2O_7$:-

(A) 0.5   (B) 1   (C) 1.5   (D) 2

17. Equivalent weight of $kMnO_4$ in acidic medium

(A) M   (B) $\dfrac{M}{2}$

(C) $\dfrac{M}{5}$ (D) $\dfrac{M}{3}$

18. Which of the following groups of molecules act both as oxidising agent as well as reducing agent ?

(A) $kMnO_4$, O_3 , SO_3

(B) $HClO_4$, HNO_2 , H_2O_2

(C) $HClO_2$, SO_2 , H_2O_2

(D) $K_2Cr_2O_7$, SO_2, H_2SO_4

19. $aZn + bNO_3^- + cH^+ \rightarrow dNH_4^+ + eH_2O + fZn^{+2}$

a, b, c, d, e and f are

	a	b	c	d	e	f
(1)	2	4	6	8	4	2
(2)	1	4	10	3	1	4
(3)	4	1	10	1	3	4
(4)	10	4	1	3	4	2

(A) 1

(B) 2

(C) 3

(D) 4

20. Which of the following reaction depicts oxidizing behaviour of H_2SO_4 ?

(A) $Ca(OH)_2 + H_2SO_4 \rightarrow 2H_2O + CaSO_4$

(B) $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$

(C) $2PCl_5 + H_2SO_4 \rightarrow 2POCl_3 + 2HCl + SO_2Cl_2$

(D) $2HI + H_2SO_4 \rightarrow I_2 + SO_2 + 2H_2O$

Space for Rough Work

This section contains 10 questions Candidates have to attempt any 5 questions out of 10. If more than 5 questions are attempted, then only first 5 attempted questions will be evaluated.

The answer to each question is a **Numerical Value**. For each question, enter the correct integer value (In case of non-integer value, the answer should be rounded off to the nearest Integer).

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If correct answer is entered.
Zero Marks : 0 If the question is unanswered.
Negative Marks : −1 If wrong answer is entered.

1. Oxidation number of Cr in CrO_5 is x and Fe in $Fe(CO)_5$ is y then calculate the value of x + y.

2. 6×10^{-3} mole $K_2Cr_2O_7$ reacts completely with 9×10^{-3} mole X^{+n} to give XO_3^- and Cr^{+3}. The value of n is :-

3. In $H_2\underline{S}O_5, K_2\underline{Cr}_2O_7, \underline{Cr}\,O_5$ underline element having oxidation number X,Y,Z respectively then X+Y+Z will be

4. In the following reaction the value of X is
$H_2O + SO_3^{-2} \rightarrow SO_4^{-2} + 2H^+ + X\,e^-$

5. The number of electrons to balance the following equation : -
$NO_3^- + 4H^+ + e^- \rightarrow 2H_2O + NO$ is

6. A_2O_x is oxidised to AO_3^- by MnO_4^- in acidic medium. If 1.5×10^{-3} mole of A_2O_x requires 40 ml of 0.03 M $KMnO_4$ solution in acidic medium. Find the value of x.

7. An oxide of a metal contains 40% oxygen by weight. If equivalent weight of metal is M. Find value of M/3 ?

8. In an experiment, 50 mL of 0.1 M solution of a metal salt reacted with 25 mL of 0.1 M solution of sodium sulphite. The half equation for the oxidation of sulphite ion is
$SO_3^2\,(aq) + H_2O(\ell) \rightarrow SO_4^2\,(aq) + 2H^+(aq) + 2e^-$
If the oxidation number of metal in the salt was 3, what would be the new oxidation number of metal?

9. The sum of the oxidation numbers of all the carbon atoms present in the compound C_6H_5COOH will be.

10. 3 moles of $FeSO_4$ are oxidised by "a" mole of $K_2Cr_2O_7$ in acidic medium whereas 3 moles of FeC_2O_4 are oxidised by "b" mole of $K_2Cr_2O_7$ in acidic medium, The ratio of "b" and "a" is -

Space for Rough Work

PART-3 : MATHEMATICS

SECTION-I : (Maximum Marks: 80)

This section contains **20 questions**. Each question has 4 options for correct answer. Multiple-Choice Questions (MCQs) **Only one option is correct**. For each question, marks will be awarded as follows:

Full Marks : +4 If correct answer is selected.

Zero Marks : 0 If none of the option is selected.

Negative Marks : −1 If wrong option is selected.

1. The general solution of $4\tan^2\theta = 3\sec^2\theta$ is :-

   (A) $n\pi \pm \dfrac{\pi}{3}, n \in I$

   (B) $n\pi \pm \dfrac{\pi}{4}, n \in I$

   (C) $2n\pi \pm \dfrac{\pi}{4}, n \in I$

   (D) None

2. The most general values of x for which
   $\sin x + \cos x = \min\limits_{a \in R}\{1, a^2 - 4a + 6\}$ are given by :-

   (A) $2n\pi$

   (B) $2n\pi + \dfrac{\pi}{12}$

   (C) $n\pi + (-1)^n \times \dfrac{\pi}{4} - \dfrac{\pi}{4}$

   (D) none of these

3. If $0 \le x \le 2\pi$, $0 \le y \le 2\pi$ and $\sin x + \sin y = 2$, then the value of $x + y$ is :-

   (A) π

   (B) $\dfrac{\pi}{2}$

   (C) 3π

   (D) None of these

4. If $3\tan(\theta - 15^\circ) = \tan(\theta + 15^\circ)$, then θ is equal to $(n \in Z)$:

   (A) $n\pi + \dfrac{\pi}{4}$

   (B) $n\pi + \dfrac{\pi}{8}$

   (C) $n\pi + \dfrac{\pi}{3}$

   (D) None of these

5. The smallest positive x satisfying the equation $\log_{\cos x}\sin x + \log_{\sin x}\cos x = 2$ is :

   (A) $\dfrac{\pi}{2}$ (B) $\dfrac{\pi}{3}$

   (C) $\dfrac{\pi}{4}$ (D) $\dfrac{\pi}{6}$

6. If $\sin 6\theta + \sin 4\theta + \sin 2\theta = 0$, then θ is equal to $[n \in Z]$:

   (A) $\dfrac{n\pi}{4}$ or $n\pi \pm \dfrac{\pi}{3}$

   (B) $\dfrac{n\pi}{4}$ or $n\pi \pm \dfrac{\pi}{6}$

   (C) $\dfrac{n\pi}{4}$ or $2n\pi \pm \dfrac{\pi}{6}$

   (D) None of these

7. The angle of elevation of the cloud at a point 2500 m high from the lake is 15° and the angle of depression of its reflection to the lake is 45°. Then the height of the cloud from the surface of lake is :

   (A) $2500\sqrt{3}$ m

   (B) 2500 m

   (C) $500\sqrt{3}$ m

   (D) None of these

Space for Rough Work

8. The angle of elevation of the sun if the length of the shadow of a tower is $\sqrt{3}$ times the height of the tower is :-

(A) 150°   (B) 30°

(C) 60°   (D) 45°

9. If $\cos^2\theta = \cos 2\theta$ then θ is :- [where n ∈ Z]

(A) $n\pi$, n ∈ Z

(B) $2n\pi$, n ∈ Z

(C) $\dfrac{n\pi}{3}$, n ∈ Z

(D) None of these

10. The smallest positive value of θ satisfying the equation $\sqrt{3}(\cot\theta + \tan\theta) = 4$ is :-

(A) $\dfrac{2\pi}{3}$ (B) $\dfrac{\pi}{3}$

(C) $\dfrac{\pi}{6}$ (D) $\dfrac{\pi}{12}$

11. If $\tan 3\theta + \tan 5\theta + \tan 7\theta = \dfrac{\tan 3\theta.\tan 7\theta}{\cot 5\theta}$ then θ equals (where n ∈ Z) :-

(A) $\dfrac{n\pi}{10}$ (B) $\dfrac{n\pi}{5}$

(C) $\dfrac{n\pi}{12}$ (D) $\dfrac{n\pi}{15}$

12. The general solution of the equation :-
$\sin^{50}x - \cos^{50}x = 1$ is

(A) $2n\pi + \dfrac{\pi}{2}$, n ∈ Z

(B) $2n\pi + \dfrac{\pi}{3}$, n ∈ Z

(C) $n\pi + \dfrac{\pi}{2}$, n ∈ Z

(D) $n\pi + \dfrac{\pi}{3}$, n ∈ Z

13. The angle of depression of a point situated at a distance of 70 meters from the base of a tower is 45°. The height of the tower is :-

(A) 70 meters   (B) $70\sqrt{2}$ meters

(C) $\dfrac{70}{\sqrt{2}}$ meters   (D) 35 meters

14. Two pillars of equal height stand on either side of a road way which is 60 m wide. At a point in the roadway between the pillars, the elevation of the top of pillars are 60° and 30°. The height of the pillars is :-

(A) $15\sqrt{3}$m   (B) $\dfrac{15}{\sqrt{3}}$m

(C) 15 m   (D) 20 m

15. 20 m high flag pole is fixed on a 80 m high pillar, 50 m away from it, on a point, on the base of pillar the flag pole makes an angle α, then the value of tan α, is :-

(A) $\dfrac{2}{21}$ (B) 2

(C) $\dfrac{21}{2}$ (D) $\dfrac{21}{4}$

16. The perimetre of ΔABC is 6 times to the A.M of sines of its angles. If a = 1, Then ∠A =

(A) $\dfrac{\pi}{3}$ (B) $\dfrac{\pi}{6}$

(C) $\dfrac{\pi}{2}$ (D) $\dfrac{\pi}{4}$

17. If λ be the perimeter of the ΔABC, then $b\cos^2\left(\dfrac{C}{2}\right) + c\cos^2\left(\dfrac{B}{2}\right)$ is equal to :-

(A) λ   (B) 2λ

(C) λ/2   (D) None of these

Space for Rough Work

18. The upper 3/4th portion of a vertical pole subtends an angle $\tan^{-1}3/5$ at a point in the horizontal plane through its foot and at a distance 40 m from the foot. A possible height of the vertical pole is :

(A) 20 m

(B) 40 m

(C) 60 m

(D) 80 m

19. ABC is a triangular park with AB = AC = 100 m. A clock tower is situated at the mid-point of BC. The angles of elevation of the top of the tower at A and B are $\cot^{-1}(3.2)$ and $\operatorname{cosec}^{-1}(2.6)$ respectively. The height of the tower is : (in meter)

(A) 16 m

(B) 25 m

(C) 50 m

(D) None of these

20. If b + c = 3a, then $\cot\dfrac{B}{2}\cot\dfrac{C}{2}$ is equal to :-

(A) 3

(B) 1

(C) 4

(D) 2

SECTION-II : (Maximum Marks: 20)

This section contains 10 questions Candidates have to attempt any 5 questions out of 10. If more than 5 questions are attempted, then only first 5 attempted questions will be evaluated.

The answer to each question is a **Numerical Value.** For each question, enter the correct integer value (In case of non-integer value, the answer should be rounded off to the nearest Integer).

Answer to each question will be evaluated according to the following marking scheme:

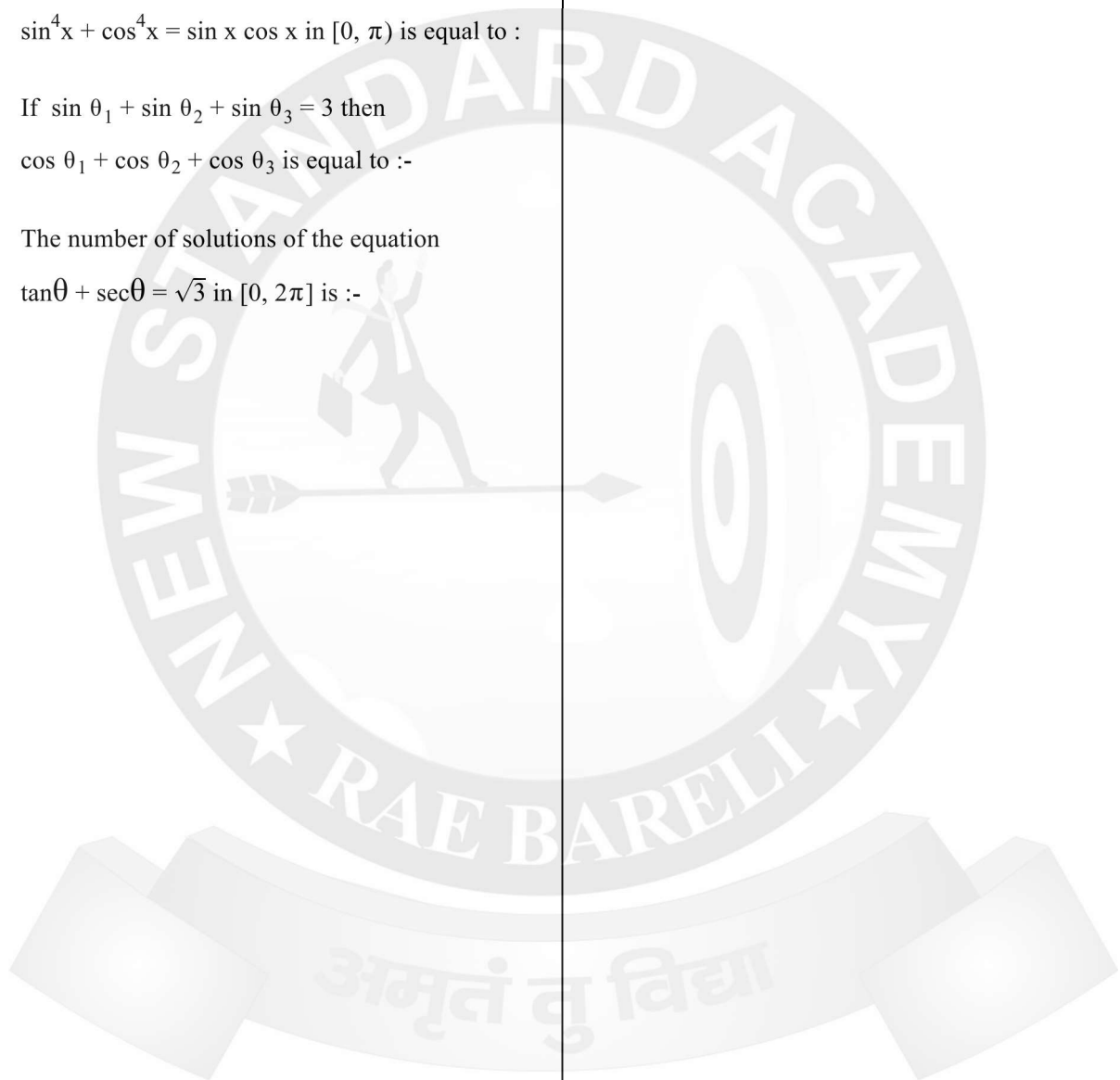*Full Marks* : +4 If correct answer is entered.

Zero Marks : 0 If the question is unanswered.

Negative Marks : –1 If wrong answer is entered.

1. A house of height 100 m subtends a right angle at the window of an opposite house. If the height of the window be 64 m, then find the distance between the two houses.

2. In $\triangle ABC$, a = 8, b = 10 and c = 12. Then C is equal to :

3. A person standing on the bank of a river observes that the angle subtended by a tree on the opposite bank is 60°. When he retreats 20 ft from the bank, he finds the angle to be 30°. The breadth of the river in feet is :-

4. The angles of elevation of the top of a tower at the top and the foot of a pole of height 10 meters are 30° and 60° respectively. The height of the tower is :-

5. Number of ordered pairs (θ, y) for which $1 + y^2 = \cos^2\theta$, $\theta \in [0, 2\pi]$, y R is :

Space for Rough Work

6. The number of solutions of the equation
$3\sin^2 x - 7\sin x + 2 = 0$ in the interval $[0, 5\pi]$ is :-

7. If $0 \le x \le 2\pi$, then the number of solution of
$3(\sin x + \cos x) - 2(\sin^3 x + \cos^3 x) = 8$ is :

8. The total number of solutions of
$\sin^4 x + \cos^4 x = \sin x \cos x$ in $[0, \pi)$ is equal to :

9. If $\sin \theta_1 + \sin \theta_2 + \sin \theta_3 = 3$ then
$\cos \theta_1 + \cos \theta_2 + \cos \theta_3$ is equal to :-

10. The number of solutions of the equation
$\tan\theta + \sec\theta = \sqrt{3}$ in $[0, 2\pi]$ is :-

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