



CLASSROOM CONTACT PROGRAMME

(Academic Session : 2019 - 2020)

JEE (Main + Advanced) : NURTURE COURSE

PHASE : TNG & TNF

Test Type : MINOR TEST

Test Pattern : JEE-Advanced

TEST DATE : 08 - 09 - 2019

Time : 3 Hours

PAPER – 2

Maximum Marks : 210

READ THE INSTRUCTIONS CAREFULLY

GENERAL :

1. This sealed booklet is your Question Paper. Do not break the seal till you are told to do so.
2. Use the Optical Response sheet (ORS) provided separately for answering the questions.
3. Blank spaces are provided within this booklet for rough work.
4. Write your name, form number and sign in the space provided on the back cover of this booklet.
5. After breaking the seal of the booklet, verify that the booklet contains **32** pages and that all the **20** questions in each subject and along with the options are legible. If not, contact the invigilator for replacement of the booklet.
6. You are allowed to take away the Question Paper at the end of the examination.

OPTICAL RESPONSE SHEET :

7. The ORS will be collected by the invigilator at the end of the examination.
8. Do not tamper with or mutilate the ORS. **Do not use the ORS for rough work.**
9. Write your name, form number and sign with pen in the space provided for this purpose on the ORS. **Do not write any of these details anywhere else on the ORS.** Darken the appropriate bubble under each digit of your form number.

DARKENING THE BUBBLES ON THE ORS :

10. Use a **BLACK BALL POINT PEN** to darken the bubbles on the ORS.
11. Darken the bubble **COMPLETELY.**
12. The correct way of darkening a bubble is as :
13. The ORS is machine-gradable. Ensure that the bubbles are darkened in the correct way.
14. Darken the bubbles **ONLY IF** you are sure of the answer. There is **NO WAY** to erase or "un-darken" a darkened bubble.
15. Take **$g = 10 \text{ m/s}^2$** unless otherwise stated.

Please see the last page of this booklet for rest of the instructions

DO NOT BREAK THE SEALS WITHOUT BEING INSTRUCTED TO DO SO BY THE INVIGILATOR

SOME USEFUL CONSTANTS

Atomic No. : H = 1, B = 5, C = 6, N = 7, O = 8, F = 9, Al = 13, P = 15, S = 16, Cl = 17, Br = 35, Xe = 54, Ce = 58

Atomic masses : H = 1, Li = 7, B = 11, C = 12, N = 14, O = 16, F = 19, Na = 23, Mg = 24, Al = 27, P = 31, S = 32, Cl = 35.5, Ca = 40, Fe = 56, Br = 80, I = 127, Xe = 131, Ba = 137, Ce = 140,

- | | |
|------------------------------------|--------------------------------------------------------------|
| • Boltzmann constant | $k = 1.38 \times 10^{-23} \text{ JK}^{-1}$ |
| • Coulomb's law constant | $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9$ |
| • Universal gravitational constant | $G = 6.67259 \times 10^{-11} \text{ N-m}^2 \text{ kg}^{-2}$ |
| • Speed of light in vacuum | $c = 3 \times 10^8 \text{ ms}^{-1}$ |
| • Stefan-Boltzmann constant | $\sigma = 5.67 \times 10^{-8} \text{ Wm}^{-2}\text{-K}^{-4}$ |
| • Wien's displacement law constant | $b = 2.89 \times 10^{-3} \text{ m-K}$ |
| • Permeability of vacuum | $\mu_0 = 4\pi \times 10^{-7} \text{ NA}^{-2}$ |
| • Permittivity of vacuum | $\epsilon_0 = \frac{1}{\mu_0 c^2}$ |
| • Planck constant | $h = 6.63 \times 10^{-34} \text{ J-s}$ |

Space for Rough Work

HAVE CONTROL → HAVE PATIENCE → HAVE CONFIDENCE ⇒ 100% SUCCESS

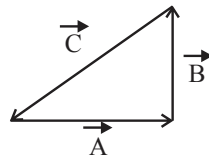
BEWARE OF NEGATIVE MARKING

PART-1 : PHYSICS

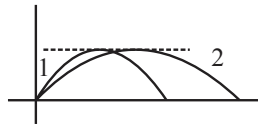
SECTION-I(i) : (Maximum Marks : 40)

- This section contains **TEN** questions.
- Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).
- For each question, darken the bubble corresponding to the correct option in the ORS.
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Negative Marks : -1 In all other cases

1. Which expression is/are correct concerning the vectors shown in the sketch?



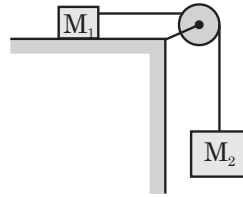
- (A) $\vec{C} = \vec{A} + \vec{B}$ (B) $\vec{C} + \vec{A} = -\vec{B}$ (C) $\vec{A} + \vec{B} + \vec{C} = 0$ (D) $|\vec{C}| = |\vec{A} + \vec{B}|$
2. Trajectories of two stones projected from level ground are shown. Let T_1 , T_2 be their time of flights and u_1 , u_2 their speeds of projection then



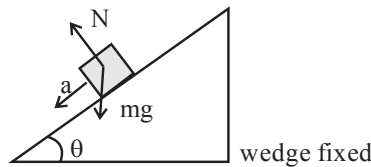
- (A) $T_2 > T_1$ (B) $u_2 > u_1$ (C) $T_2 = T_1$ (D) $u_2 = u_1$

Space for Rough Work

3. The diagram shows two blocks connected by a light inextensible rope hung over a light frictionless pulley. Block 1 slides without friction. Block 2 has the larger mass. Select the **true** statement(s).



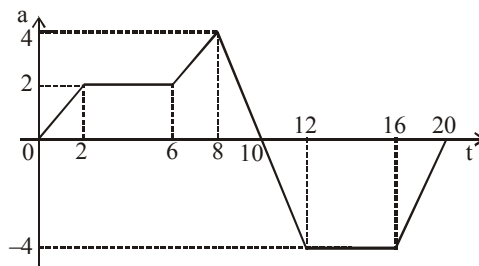
- (A) The magnitude of acceleration of block 2 is less than g .
 (B) The force of the table on block 1 equals in magnitude to the weight of block 1
 (C) The acceleration of block 2 depends on the mass of block 1
 (D) The blocks have the same acceleration.
4. For the system which of the option(s) are correct. [a is acceleration of block and N is normal force by wedge]



- (A) $N \cos\theta = mg$ (B) $N = mg \cos\theta$
 (C) $N - mg \cos\theta = ma$ (D) $mg - N \cos\theta = ma \sin\theta$

Space for Rough Work

5. If initial velocity of particle is 4 m/s, the maximum velocity of particle from $t = 0$ to $t = 20$ sec is :



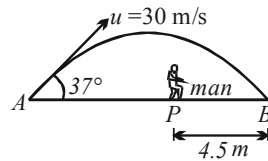
- (A) 20 m/s (B) 18 m/s (C) 22 m/s (D) 24 m/s
6. A particle moving along a straight line with uniform acceleration has velocities 7m/s at A and 17 m/s at C. B is the mid point of AC. Then
- (A) The velocity at B is 12 m/s.
 (B) The average velocity between A and B is 10 m/s.
 (C) The ratio of the time to go from A to B to that from B to C is 3 : 2.
 (D) The average velocity between B and C is 15 m/s.

Space for Rough Work

7. A particle moves along the X-axis as $x = u(t - 1) + a(t - 1)^2$
- (A) The initial velocity of the particle is u
(B) The acceleration of the particle is a
(C) The acceleration of the particle is $2a$
(D) At $t = 2s$ particle is at the origin.
8. A boy throws a ball from shoulder height at an initial velocity of 50 m/s . Spending 8 s in air, the ball is caught by another boy at the same shoulder-height level. What is the angle of projection?
- (A) 37° (B) 30° (C) 53° (D) 60°

Space for Rough Work

9. A ball is hit by a batsman at an angle of 37° as shown in figure. The man standing at P should run at what minimum constant velocity so that he catches the ball before it strikes the ground. Assume that height of man is negligible in comparison to maximum height of projectile.



- (A) 3 m/s (B) 5 m/s (C) 4.5 m/s (D) 1.25 m/s
10. A flag is mounted on a car moving due North with velocity of 10 km/hr. Strong winds are blowing due East with velocity of 10 km/hr. The flag will point in direction :-
- (A) East (B) North-East (C) South-East (D) South-West

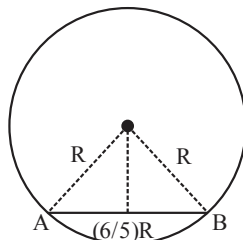
Space for Rough Work

SECTION-II : Numerical Value Type (Up to second decimal place)
No question will be asked in section II

SECTION-III : (Maximum Marks : 30)

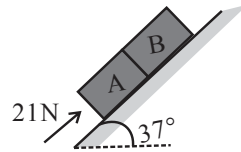
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-
1. The energy E of an oscillating body in simple harmonic motion depends on its mass m frequency n and amplitude A as $E = k(m)^x(n)^y(A)^z$. Find the value of $(2x + y + z)$ [Amplitude is distance]
 2. In a hemispherical shell of radius R , a rod AB of mass 1.44 kg is placed horizontally as shown in figure. The length of rod is $\frac{6}{5}R$. Find the normal reaction at end A of the rod in newton.

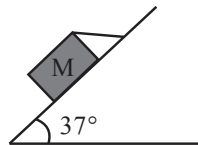


Space for Rough Work

3. Blocks A and B of masses 2 kg and 1 kg respectively are pushed up a frictionless slope by a 21 N force applied parallel to the slope as shown in the figure. Find the magnitude (in newtons) of the force of normal reaction between A and B. [$g = 10 \text{ m/s}^2$]

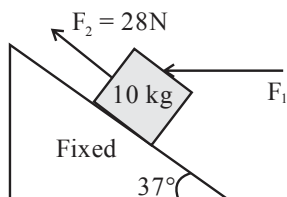


4. A block of mass 160 gm is resting on a smooth inclined plane as shown in figure. The block is tied up by a horizontal string. Find normal contact force (in newton) due to incline on block.

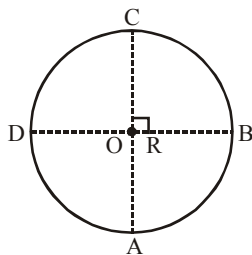


Space for Rough Work

5. Diagram shows a block at rest in equilibrium on a fixed inclined plane. If for the given case F_1 is horizontal and F_2 is along the incline, fill $\frac{F_1}{5}$ in OMR sheet.



6. A particle starts from point A with constant speed $3\pi\sqrt{2}$ on a circle of radius R. Find magnitude of average velocity during its journey from A to D :- (particle moves along ABCD)



Space for Rough Work

7. The vertical height y and horizontal distance x of a projectile on a certain planet are given by $x = (3\sqrt{2} t)$ m, $y = (3\sqrt{2} t - 6t^2)$ m where t is in seconds. Find the speed of projection (in m/s).
8. A cricketer can throw a ball to a maximum horizontal distance of 50 m. If he can throw maximum h (m) above ground then value of $h/5$ will be:

Space for Rough Work

9. A particle is projected in x - y plane with y -axis along vertical, the point of projection is origin.

The equation of a path is $y = \sqrt{3}x - \frac{gx^2}{2}$. If angle of projection is θ° . Then $2\theta/15$ is

10. A particle is projected in the x - y plane with y -axis along vertical. Two second after projection the velocity of the particle makes an angle 45° with the X -axis. Four second after projection, it moves horizontally. If velocity of projection is $20\sqrt{x}$, then find out value of x .

Space for Rough Work

PART-2 : CHEMISTRY**SECTION-I(i) : (Maximum Marks : 40)**

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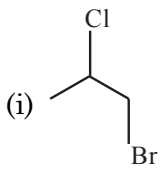
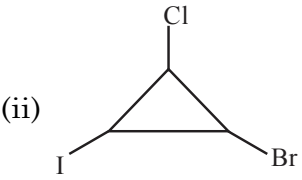
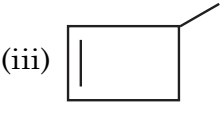
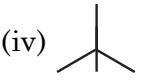
-
1. 50ml of 20.8% w/v BaCl₂(aq.) and 100 ml of 9.8 % w/v H₂SO₄(aq) solution are mixed. Then in final solution : (Atomic weight of Ba = 137)
(A) [Cl⁻] = 0.66M (B) [H⁺] = 1.33M (C) [Ba²⁺] ≈ 0 M (D) [SO₄²⁻] = 0.33 M
2. What is the volume of HCl of specific gravity 1.2 and 3.65% by weight, which can produce at least 1.12 L Cl₂ at 1 atm and 273 K by the following reaction :
- $$\text{MnO}_2 + \text{HCl} \rightarrow \text{MnCl}_2 + \text{H}_2\text{O} + \text{Cl}_2$$
- (A) 200 ml (B) 166.7 ml (C) 333.3 ml (D) 267 ml
3. 1g molecule of V₂O₅ contains :
(A) 5 mole of oxygen atom (B) 2 mole of V atom
(C) 1 mole of oxygen atom (D) 2.5 mole of oxygen atom
-

Space for Rough Work

4. A metallocene derivative (molecular weight = 282) has approximately 100/3 % sulfur by mass. Number of S atoms in 288 g of metallocene derivative is :
[S = 32], [$N_A = 6.022 \times 10^{23}$]
- (A) $10 N_A$ (B) $3 N_A$ (C) $30 N_A$ (D) $6.6 N_A$
5. Which of the following oxides is/are amphoteric ?
- (A) Na_2O (B) CaO (C) Al_2O_3 (D) SnO_2
6. Which of the following orbital(s) cannot form δ -bond ?
- (A) $d_{x^2-y^2}$ -orbital (B) d_{xy} -orbital (C) d_{z^2} -orbital (D) p_x -orbital
7. Which single bond dissociation energy order is correct ?
- (A) $C-C > Si-Si$ (B) $N-N < P-P$ (C) $F-F < Cl-Cl$ (D) $O-O > S-S$

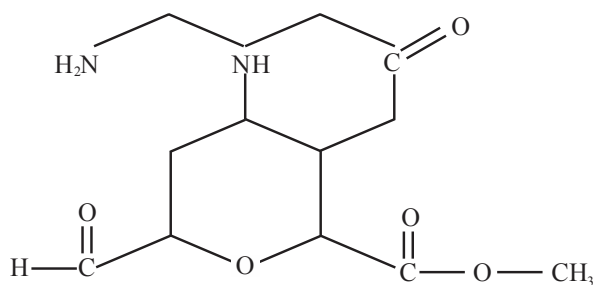
Space for Rough Work

8. Which of the following is/are not correct

Compound	IUPAC name
(i) 	1-bromo-2-chloropropane
(ii) 	1-bromo-2-chloro-3-iodo cyclopropane
(iii) 	2-methyl cyclobut-1-ene
(iv) 	2,2-dimethylpropane

(A) (i), (ii), (iii) (B) (ii), (iii), (iv) (C) (i), (ii), (iv) (D) (i), (iii), (iv)

9. Find the number of hetero atom and type of hetero atoms in the given compound respectively.



(A) 2, 2

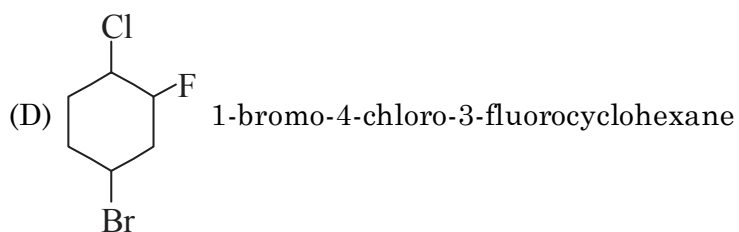
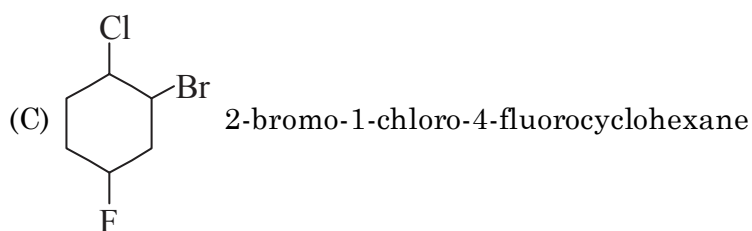
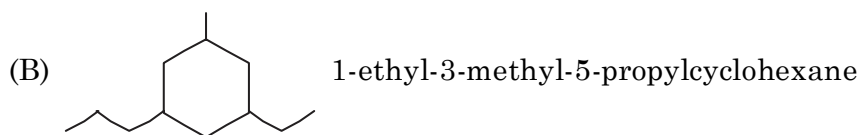
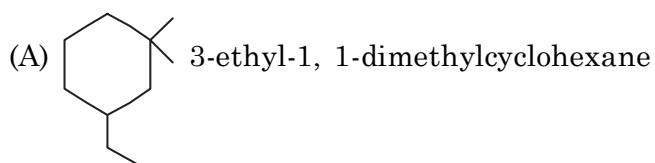
(B) 2, 3

(C) 3, 3

(D) 2, 1

Space for Rough Work

10. Which of the following IUPAC names are correct :



Space for Rough Work

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SECTION-III : (Maximum Marks : 30)

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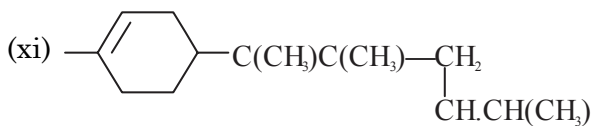
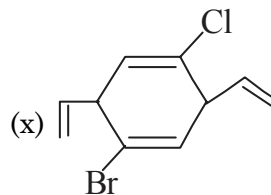
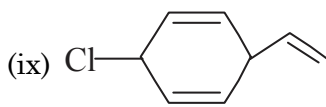
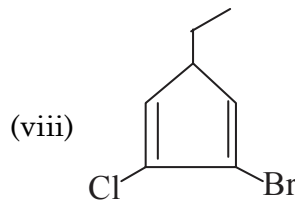
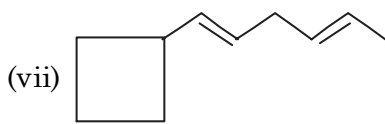
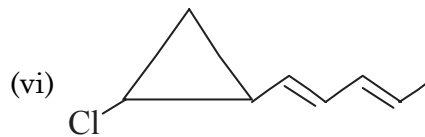
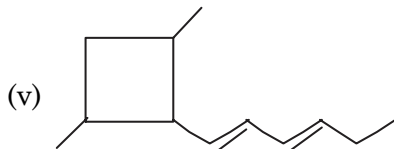
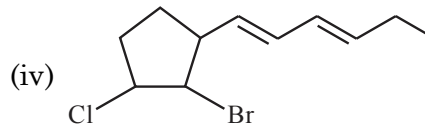
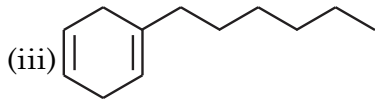
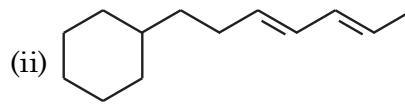
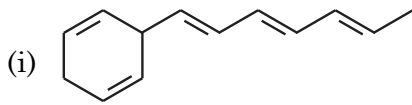
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1. If the density of methanol is 0.793 kg L^{-1} , what is its volume needed for making 0.0027 m^3 of its 0.22 M solution? (report your answer as $1 + 3 = 4$, $5 + 4 = 9$)
 2. Find the molarity of $5.6\% \text{ w/v KOH}$ if density of solution is 1.4 g/ml :
 3. What is the number of moles of O-atom in 126 g of HNO_3 is :
-

Space for Rough Work

4. The first, second and third ionisation energies (E_1 , E_2 & E_3) for an element are 7eV, 12.5eV and 42.5eV respectively. The most stable oxidation state of the element will be :
5. Among the following, total number of planar species is ?
- (i) SF_4 (ii) BrF_3 (iii) XeF_2 (iv) IF_5
(v) SbF_4^- (vi) SF_5^- (vii) SeF_3^+ (viii) CH_3^+
(ix) PCl_4^+
6. Calculate the number of $p_\pi - d_\pi$ bond(s) present in SO_4^{2-} :

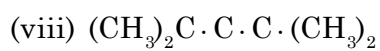
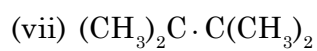
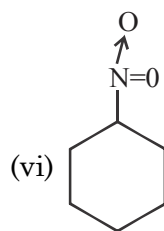
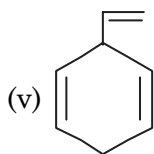
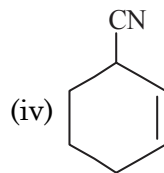
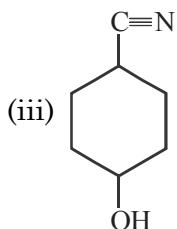
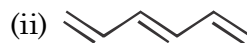
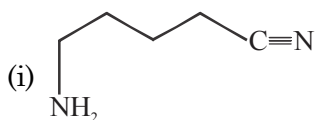
Space for Rough Work

7. In the given compounds how many are having hex word root and diene in primary suffix in their IUPAC name



Space for Rough Work

8. The number of unsaturated hydrocarbons from the following compounds is/are :

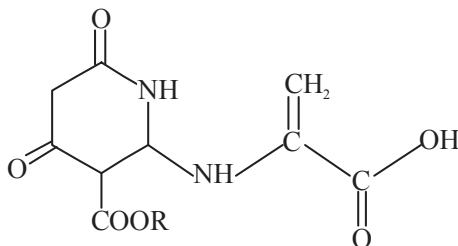


Space for Rough Work

9. Which of the following is correct ?

Compound	Molecular formula (first member)
(1) Carboxylic acid	H_2CO_2
(2) Ester	H_3CO_2
(3) Ether	H_6C_2O
(4) Alcohol	H_4CO
(5) Alkenyne	H_4C_4
(6) Aldehyde	H_2CO

10. How many functional groups are present in the given compound ?



Space for Rough Work

PART-3 : MATHEMATICS
SECTION-I(i) : (Maximum Marks : 40)

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Zero Marks : 0 If none of the bubbles is darkened
Negative Marks : -1 In all other cases

1. If $\sin(x - y) = \cos(x + y) = \frac{1}{2}$, then values of x and y lying between 0 and π are given by :

(A) $x = \frac{\pi}{4}, y = \frac{3\pi}{4}$ (B) $x = \frac{\pi}{4}, y = \frac{\pi}{12}$ (C) $x = \frac{5\pi}{4}, y = \frac{5\pi}{12}$ (D) $x = \frac{11\pi}{12}, y = \frac{3\pi}{4}$

2. Which of the following are true ?

(A) $\sin 22\frac{1}{2}^\circ = \frac{\sqrt{2-\sqrt{2}}}{2}$

(B) $\tan 22\frac{1}{2}^\circ = \sqrt{2} - 1$

(C) $\cos 22\frac{1}{2}^\circ = \frac{\sqrt{2+\sqrt{2}}}{2}$

(D) $\cot 22\frac{1}{2}^\circ = \sqrt{2} + 1$

Space for Rough Work

3. Which of the following is/are true ?
- (A) $\cos 2\theta \cdot \cos \theta - \sin 4\theta \cdot \sin \theta = \cos 3\theta \cdot \cos 2\theta$
- (B) $\cos 20^\circ + \cos 100^\circ + \cos 140^\circ = 0$
- (C) $\sin 5\theta + \sin 2\theta - \sin \theta = \sin 2\theta (2\cos 3\theta + 1)$
- (D) $\frac{\cos \theta + \sin \theta}{\cos \theta - \sin \theta} = \tan 2\theta + \sec 2\theta$

4. A solution of the equation $x^{\log_{10}(2x)} = 5$ is :

- (A) 0.2 (B) 0.1 (C) 5 (D) 4

Space for Rough Work

5. If α and $\frac{1}{\alpha}$ ($\alpha > 0$) are roots of $ax^2 - bx + c = 0$, ($a > 0$) then :
- (A) $c = a$ (B) $c \geq 2b$ (C) $b \geq 2a$ (D) $a \geq 2b$
6. If the equations $4x^2 - 11x + 2k = 0$ and $x^2 - 3x - k = 0$ have a common root α , then :
- (A) $k = 0$ (B) $k = -\frac{17}{36}$ (C) $\alpha = 0$ (D) $\alpha = \frac{17}{6}$

Space for Rough Work

7. The number $N = \frac{1 + 2\log_3 2}{(1 + \log_3 2)^2} + \log_6^2 2$ when simplified reduces to :
- (A) A prime number (B) An irrational number
(C) A real number less than $\log_3 \pi$ (D) A real number greater than $\log_7 6$
8. Which of the following are (is) irrational ?
(A) $\sin 15^\circ$ (B) $\cos 15^\circ$ (C) $\sin 15^\circ \cdot \cos 15^\circ$ (D) $\sin 15^\circ \cdot \cos 75^\circ$

Space for Rough Work

9. If $y = \sin x \cdot \sin(60^\circ - x) \cdot \sin(60^\circ + x)$, then :

(A) minimum value of y is $-\frac{1}{4}$ (B) maximum value of y is 1

(C) minimum value of y is -1 (D) $y < 1$

10. Solution of the equation $1 + \sin x + \cos 3x = \cos x + \cos 2x + \sin 2x$ is :

(A) $x = n\pi, n \in \mathbb{Z}$ (B) $x = 2n\pi \pm \left(\frac{\pi}{3}\right), n \in \mathbb{Z}$

(C) $x = 2n\pi \pm \frac{\pi}{8}, n \in \mathbb{Z}$ (D) $x = n\pi + (-1)^{n+1} \left(\frac{\pi}{6}\right), n \in \mathbb{Z}$

Space for Rough Work

SECTION-II : Numerical Value Type (Up to second decimal place)
No question will be asked in section II

SECTION-III : (Maximum Marks : 30)

- This section contains **TEN** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive.
- For each question, darken the bubble corresponding to the correct integer in the ORS.
- For each question, marks will be awarded in one of the following categories :
Full Marks : +3 If only the bubble corresponding to the correct answer is darkened.
Zero Marks : 0 If none of the bubbles is darkened
Negative Marks : -1 In all other cases

-
1. The number of solutions of the equation $\sin 3x + \cos 3x = 0$ in the interval $[0, \pi]$ is :
 2. The number of solutions of the equation $(1 - \cos 2x) \sin 2x = \sqrt{3} \sin^2 x$ in the interval $\left[-\pi, \frac{\pi}{3}\right]$ is :
 3. If $A + B + C = \pi$, then $\sin^2 \frac{A}{2} - \sin^2 \frac{C}{2} + \sin^2 \frac{B}{2} = p - q \cos \frac{A}{2} \cos \frac{B}{2} \sin \frac{C}{2}$ where $(p + q)$ is :

Space for Rough Work

4. If $\tan \theta + 2\tan^2 \theta + 4\tan^4 \theta - \cot \theta = -k \cot 8 \theta$, then value of k is :
 5. The integral value of k for which $x^2 - 2(4k - 1)x + 15k^2 - 2k - 7 > 0$ for all real x is:
 6. The number of integral values of x satisfying $(x + 1)^2 > 5x - 1$ and $(x + 1)^2 < (7x - 3)$ simultaneously is :
-

Space for Rough Work

7. If $x^{40} + 2$ is divided by $x^4 + 1$, then remainder is :

8. If $0 < x < \frac{\pi}{2}$ and $\sin(2 \sin x) = \cos(2 \cos x)$, then $\tan x + \cot x = \left| \frac{a}{\pi^p - b} \right|$, $(a, b, p \in \mathbb{N})$ where $\frac{a+b+p}{10}$ is equal to :

Space for Rough Work

9. In ΔABC , if $A = 75^\circ$, $B = 45^\circ$ then $\left(\frac{b + \sqrt{2}c}{a}\right)$, (where symbols have their usual meaning) =
10. In a ΔABC , the sides are in the ratio $4 : 5 : 6$. The ratio of the circumradius and the inradius is $\frac{x}{y}$, where x and y are coprime, then $|x - y|$ is :
-

Space for Rough Work

Space for Rough Work

QUESTION PAPER FORMAT AND MARKING SCHEME :

16. The question paper has three parts : Physics, Chemistry and Mathematics.
 17. Each part has two sections as detailed in the following table.

Section	Que. Type	No. of Que.	Category wise Marks for Each Question				Maximum Marks of the section
			Full Marks	Partial Marks	Zero Marks	Negative Marks	
I(i)	One or More correct Option(s)	10	+4 If only the bubble corresponding to the correct option is darkened	–	0 If none of the cases bubbles is darkened	–1 In all other cases	40
III	Single digit Integer (0.9)	10	+3 If only the bubble corresponding to correct answer is darkened	–	0 If none of the cases bubbles is darkened	–1 In all other cases	30

NAME OF THE CANDIDATE FORM NO.	
I have read all the instructions and shall abide by them. <hr style="width: 80%; margin-left: auto; margin-right: auto;"/> Signature of the Candidate	I have verified the identity, name and Form number of the candidate, and that question paper and ORS codes are the same. <hr style="width: 80%; margin-left: auto; margin-right: auto;"/> Signature of the Invigilator

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