JEE EXPERT

STAYHOME#STAYSAFE

CORONA KO STOP KARNA HAI
AT LOCKDOWN, UNLOCK YOUR POTENTIAL
PRACTICE TEST – 04

Time: 3 Hours ***Maximum Marks: 240***

Instructions:

A– Question paper format:

The question paper consists of **3 SECTION** (Physics, Chemistry and Mathematics). Each section has 2 parts.

Part–A :

(i) It contains **7** multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) for its answer, out of which **only one is correct,**

(ii) It contains **4** multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) for its answer, out of which **one or more is/are correct.**

(iii) It contains **2** groups of questions. Each group has 2 or 3 questions based on a paragraph. Each question has 4 choices (a), (b), (c) and (d) for its answer, out of which **only one is correct.**

Part–C: It contains **7** questions. The answer to each of the questions is a single–digit integer, ranging from 0 to 9. The answer will have to appropriately bubbled in the OMR sheet as per the instructions given at the beginning of the section**.**

B–Marking scheme:

The question paper consists of **3 SECTION** (Physics, Chemistry and Mathematics). Each part consists of four types questions.

(i) **Single Correct Choice:** You will be **awarded 3 marks (Total Marks: 21)** if you darken only the bubble corresponding to the correct answer and zero mark if no bubbles are darkened. In all other cases, minus **one (–1) mark** will be awarded.

(ii) **Multiple Correct Answers Type:** You will be awarded **4 marks (Total Marks: 16)** if you darken only the bubble corresponding to the correct answers and zero mark if no bubbles are darkened. No negative marks will be awarded in this Section.

(iii) **Comprehension Type:** You will be awarded **3 marks (Total Marks: 15)** if you darken only the bubble corresponding to the correct answer and zero mark if no bubbles are darkened. In all other cases, **minus one (–1)** mark will be awarded.

(iv) **Integer Answer Type:** You will be awarded **4 marks (Total Marks: 28)** if you darken the bubble corresponding to the correct answer and zero mark if no bubble is darkened. No negative marks will be awarded for in this Section

Atomic No. : H=1, He=2, Li=3, Be=4, B=5, C=6, N=7, O=8, F=9, Na=11, Mg=12, Al = 13, Si = 14, P = 15, S = 16, Cl = 17, Ar =18, K=19, Ca=20,Cr=24, Mn=25, Fe=26, Co=27, Ni=28, Cu=29, Zn=30, As=33, Br = 35, Ag = 47, Si = 21, Sn = 50, Ti = 22,I = 53, Xe = 54, Ba = 56, Pb = 82, U = 92, V = 50.

Atomic masses: H =1, He=4, Li=7, Be=9, B=11, C=12, N=14, O=16, F=19, Na=23, Mg=24, Al=27, Si=28, P=31, S=32, Cl=35.5, K=39, Ca=40, Cr=52, Mn=55, Fe=56, Co=59, Ni=58.7, Cu=63.5, Zn = 65.4, As = 75, Br = 80, Ag = 108, Sn = 118.7, I = 127, Xe = 131, Ba = 137, Pb = 207, U = 238.

Enrollment No.: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Name: ……Centre ……

Batch: …… Date ……

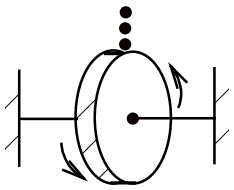
PHYSICS

SECTION–1 (PART– A)

Single Correct Choice Type

This section contains 7 multiple choice questions. Each of these questions has four choices (a), (b), (c) and (d) out of WHICH ONLY ONE CORRECT. [+3 for correct, –1 for wrong attempt]

1. A disc of mass m_0 rotates freely about a fixed horizontal axis through its center. A thin cotton pad is fixed to its rim, which can absorb water. The mass of water dripping onto the pad is μ per second. After what time will the angular velocity of the disc get reduced to half of its initial value:



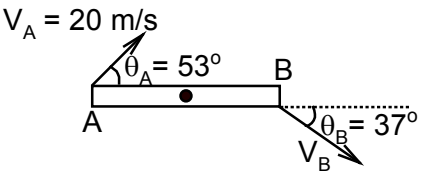
(a) $\frac{2m_0}{\mu}$ (b) $\frac{3m_0}{\mu}$

(c) $\frac{m_0}{\mu}$ (d) $\frac{m_0}{2\mu}$

2. A wheel of radius R rolls on the ground with a uniform velocity υ. The relative acceleration of topmost point of the wheel with respect to the bottommost point is.

(a) $\frac{\upsilon^2}{R}$ (b) $\frac{2\upsilon^2}{R}$ (c) $\frac{\upsilon^2}{2R}$ (d) $\frac{4\upsilon^2}{R}$

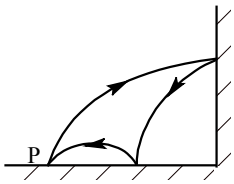
3. The two ends A and B of a uniform rod of length ℓ = 1m are moving with velocities V_A and V_B as shown. The velocity V_B is



(a) 15 m/s (b) 25 m/s

(c) 20 m/s (d) 50 m/s

4. A small ball is projected from point P on floor towards a wall as shown. It hits the wall when its velocity is horizontal. Ball reaches point P after one bounce on the floor. If the coefficient of restitution is the same for the two collisions, its value



(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{1}{3}$

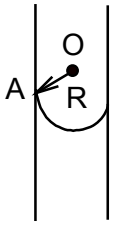
(c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2}$

Space for rough work

5. A smooth sphere is moving on a horizontal surface with a velocity vector $\left(2\hat{i}+2\hat{j}\right)$ m/s immediately before it hit a vertical wall. The wall is parallel to vector $\hat{j}$ and coefficient of restitution between the sphere and the wall is $e=\frac{1}{2}$. The velocity of the sphere after it hits the wall is

(a) $\hat{i}-\hat{j}$ (b) $-\hat{i}+2\hat{j}$ (c) $-\hat{i}-\hat{j}$ (d) $2\hat{i}-\hat{j}$

6. A capillary tube of inner radius r having sufficient length is partially dipped in a liquid in vertical position. If the angle of contact between the tube and the liquid is θ, then $\vec{R}.\vec{T}$ is equal is. Where $\vec{R}$ is the position vector of point A with respect to point O (the centre of curvature), and $\vec{T}$ is the surface tension at A as shown in the figure



(a) $rT\cos^2\theta$ (b) $rT\sin^2\theta$

(c) ZERO (d) $rT\sin\theta\cos\theta$

7. A wooden boat is in the shape of a cylinder of length 3.00 m and radius 0.350 m. It weighs 1.00×10^3 N. The maximum weight it can hold with out sinking (Density of water is 1.0×10^3 kg/m^3) is approx in kg.

(a) 477 (b) 377 (c) 277 (d) 177

Space for rough work

Multiple Correct Choice Type

This section contains 4 multiple choice questions. Each question has four choices (a),(b), (c) and (d) out of which ONE OR MORE may be correct. [+4 for correct, no negative marking and Partial marks will be awarded for partially correct answers]

8. A uniform rod of length ℓ and mass 2m rests on a smooth horizontal table. A point of mass m moving horizontally at right angle to the rod with velocity v collides with one end of the rod and sticks to it, then

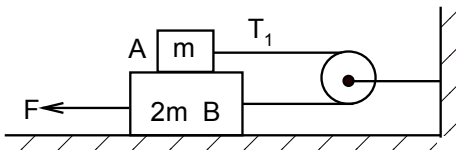
(a) Angular velocity of the system after collision is v/ℓ

(b) angular velocity of the system after collision is $v/2\ell$

(c) the loss in kinetic energy of the system as a whole as a result of the collision is $mv^2/6$

(d) the loss in kinetic energy of the system as a whole as a result of the collision is $7mv^2/24$

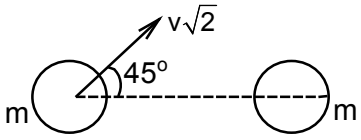
9. In the arrangement shown, coefficient of friction for all the surfaces is μ and blocks are moving with constant speed then



(a) $T_1 = \mu mg$ (b) $F = 3\mu mg$

(c) $T_1 = 2\mu mg$ (d) $F = 5\mu mg$

10. Maximum energy loss during the collision is (assume it to be an elastic)



(a) 10 % (b) 25 %

(c) 40 % (d) $\pm$ 40 %

11. A tank is filled upto a height h with a liquid and is placed on a platform of height h from the ground. To get maximum range x_m a small hole is punched at a distance of y form the free surface of the liquid. Then

(a) x_m = 2 h (b) x_m = 1.5 h (c) y = h (d) y = 0.75 h

Space for rough work

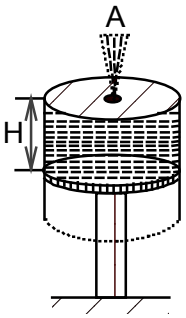
SECTION – III

Paragraph Type

This section contains 2 paragraphs. Based upon the first paragraph 2 multiple choice questions and based upon the second paragraph 3 multiple choice questions have to be answered. Each of these questions has four choices (a), (b), (c) and (d) out of WHICH ONLY ONE CORRECT. [+3 for correct, –1 for wrong attempt]

Paragraph for Question Nos. 12 to 13

In the adjacent figure a cylindrical vessel of mass M and cross-sectional area A is placed inverted on a fixed smooth piston of same cross-sectional area fixed to the ground. The space between the cylinder and piston is completely filled with liquid of density ρ. There is a small orifice of cross-sectional area a. (a << A) at the top flat portion of this vessel. Now answer the following questions. (initially length of the liquid column in the vessel is H)



12. At this instant the liquid jet. Is just able to hit a target 'A', at a height h from the orifice, then h is

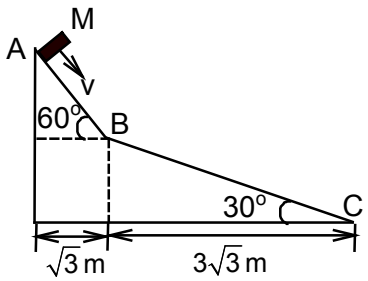
(a) $\frac{M}{2A\rho}$ (b) $\frac{M}{A\rho}$ (c) $\frac{H^2A\rho}{M}$ (d) $\frac{H^2A\rho}{2M}$

13. If a small ball is kept afloat on the liquid jet, very close to the orifice. Then find its mass considering that the liquid moves out horizontally after colliding with the ball

(a) $2M\left(\frac{A}{a}\right)^2$ (b) $\frac{2MA}{a}$ (c) $\frac{2Ma}{A}$ (d) $2M\left(\frac{a}{A}\right)^2$

Paragraph for Question Nos. 14 to 16

A small block of mass M moves on a frictionless surface of an inclined plane, as shown in figure. The angle of the incline suddenly changes from 60^o to 30^o at point B. The block is initially at rest at A. Assume that collisions between the block and the incline ar totally inelastic (g = 10 m/s^2).



14. The speed of the block at point B immediately after it strikes the second incline is

(a) $\sqrt{60}\,m/s$ (b) $\sqrt{45}\,m/s$ (c) $\sqrt{30}\,m/s$ (d) $\sqrt{15}\,m/s$

15. The speed of the block at point C, immediately before it leaves the second incline is

(a) $\sqrt{120}\,m/s$ (b) $\sqrt{105}\,m/s$ (c) $\sqrt{90}\,m/s$ (d) $\sqrt{75}\,m/s$

16. If collision between the block and the incline is completely elastic, then the vertical (upward) component of the velocity of the block at point B, immediately after it strikes the second incline is

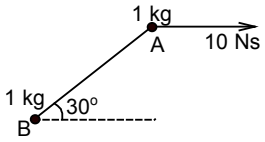
(a) $\sqrt{30}\,m/s$ (b) $\sqrt{15}\,m/s$ (c) 0 (d) $-\sqrt{15}\,m/s$

Space for rough work

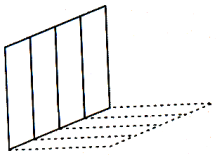
SECTION – IV
Integer Type

This section contains 7 questions. The answer to each question is a single digit integer ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled. [+4 for correct, no negative marking]

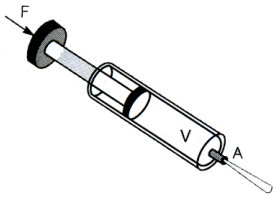
1. Two balls A and B of masses 1 kg each are connected by an inextensible massless string. The system is resting on a smooth horizontal surface. An impulse of 10 Ns is applied to the ball A at an angle 30^o with the line joining two balls in horizontal direction as shown in the figure. Assuming that the string remains taut after the impulse, if the magnitude of kinetic energy of ball A is $\frac{175}{k}$. Find the value of K.



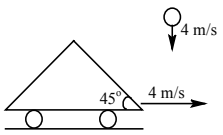
2. If the frame consist of 7 identical rods each mass m length l starts from vertical with zero speed and falls over, the top edge travelling just before it hits the ground is $\sqrt{\frac{21}{k}gl}$ Find k



3. The cylinder initially contains a volume V of ideal fluid of density ρ. The small orifice at the end of the cylinder has cross-sectional area A. If you exert a constant force on the plunger. Then work must you do to empty the cylinder in time t is $W=\frac{\rho V^x}{2A^y t^z}$. Find x + y + z.

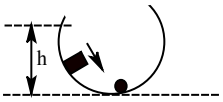


4. A small ball falling vertically downward with constant velocity 4 m/s strikes elastically a massive inclined cart moving with velocity 4 m/s horizontally as shown. The velocity of the rebound of the ball is $4\sqrt{K}$. Find K

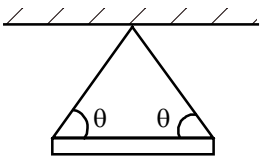


Space for rough work

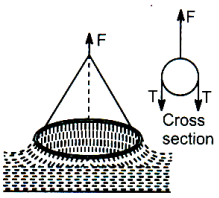
5. A block of mass m starts from rest and slides down a frictionless semi – circular track from a height h as shown. When it reaches the lowest point of the track, it collides with a stationary piece of putty also having mass m. If the block and the putty stick together and continue to slide, the maximum height that the block system could reach is. $\frac{h}{k}$ find K. (There is no projectile motion)



6. A rod mass m hangs by the help of the two string. If the angle each string makes with the rod is θ then the tension in the other string is $= \frac{p\ mg\ \sin\theta}{1 + q\ \sin^2\theta}$. Then p + q is



7. A ring is cut from a platinum tube of 8.5 cm internal and 9.5 cm external diameter. It is supported horizontally form a pan of a balance so that it comes in contact with the water in a glass vessel. The surface tension m CGS unit of water if an extra 9π weight is required to pull it away from water (g = 1000 cm/s^2) is 100 K. Find K



Space for rough work

CHEMISTRY

SECTION – 1 (PART– A)

Single Correct Choice Type

This section contains 7 multiple choice questions. Each of these questions has four choices (a), (b), (c) and (d) out of WHICH ONLY ONE CORRECT. [+3 for correct, –1 for wrong attempt]

1. For the gaseous reaction, $A(g) \rightarrow 4B(g) + 3C(g)$ is found to be first order with respect to A. If at the starting the total pressure was 100 mm Hg and after 20 minutes it is found to be 400 mm Hg. The rate constant of the reaction is
(a) 20 min^{-1} (b) 1.2×10^{-3} sec^{-1} (c) 5.7×10^{-4} sec^{-1} (d) 3.4×10^{-2} sec^{-1}

2. Four separate solutions (each of 0.1 M) of four sodium salts NaW, NaX, NaY and NaZ has pH 7.0, 9.0, 10.0 and 11.0 respectively. The Acid with the lowest pKa value is
(a) HW (b) HX (c) HY (d) HZ

3. For the chemical reaction
$3X(g) + Y(g) \rightleftharpoons X_3Y(g)$, The amount of X_3Y at equilibrium is affected by
(a) Temperature only (b) Pressure only
(c) Both temperature and pressure (d) Temperature, pressure and catalyst

4. Among the following, the extensive property is
(a) Vapour pressure (b) Molarity
(c) Standard heat of formation (d) Entropy

5. The equilibrium constants K_{p_1} and K_{p_2} for the reactions X (g) $\rightleftharpoons$ 2 Y (g) and Z(g) $\rightleftharpoons$ P(g)+Q(g), respectively are in the ratio of 1 : 9. If the degree of dissociation of X and Z be equal, then the ratio of total pressures at these equilibria is
(a) 1 : 1 (b) 1 : 3 (c) 1 : 9 (d) 1:36

6. Calculate the entropy change at 373K for the following transformation. H_2O (l, 1.01325 bar) $\rightarrow$ H_2O (g, 0.101325 bar). Given $\Delta_{vap}H(H_2O) = 37.3\,kJmol^{-1}$
(a) 19.14 JK^{-1} mol^{-1} (b) 119.14 JK^{-1} mol^{-1}
(c) 80.86 JK^{-1} mol^{-1} (d) 180.86 $JK^{-1}mol^{-1}$

7. Wollastonite, $Ca_3(Si_3O_9)$ has
(a) One oxygen atom shared per tetrahedron
(b) Two oxygen atoms shared per tetrahedron
(c) Three oxygen atoms shared per tetrahedron
(d) Four oxygen atoms shared per tetrahedron

Space for rough work

Multiple Correct Choice Type

This section contains 4 multiple choice questions. Each question has four choices (a),(b), (c) and (d) out of which ONE OR MORE may be correct. [+4 for correct, no negative marking and Partial marks will be awarded for partially correct answers]

8. 1 mole of $Ba(OH)_2$ will exactly neutralize
   (a) 0.5 mole HCl (b) 1 mole of H_2SO_4 (c) 1 mole of H_3PO_3 (d) 2 moles of H_3PO_2

9. K_C for the reaction $2A\ (g) + B(g) \rightleftharpoons A_2B(g)$ is 2×10^{-2} at 25^oC and it is 2×10^{-1} at 50^oC. Choose the incorrect statement (s) from the following
   (a) Decomposition of A_2B is favoured at low temperature
   (b) Formation of A_2B is favoured at low pressure.
   (c) Formation of A_2B is favoured by introducing an inert gas at constant pressure.
   (d) Decomposition of A_2B is favoured by removing B(g) from the reaction mixture

10. Choose the correct statement (s) : Degree of hydrolysis (h) for a salt of strong acid and weak base is
    (a) independent of dilution (b) increases with dilution
    (c) increases with decrease in K_b (d) increases with increase in temperature

11. Which carbides react with water to give methane?
    (a) CaC_2 (b) Be_2C (c) Mg_2C_3 (d) Al_4C_3

Space for rough work

SECTION – III

Paragraph Type

This section contains 2 paragraphs. Based upon the first paragraph 2 multiple choice questions and based upon the second paragraph 3 multiple choice questions have to be answered. Each of these questions has four choices (a), (b), (c) and (d) out of WHICH ONLY ONE CORRECT. [+3 for correct, –1 for wrong attempt]

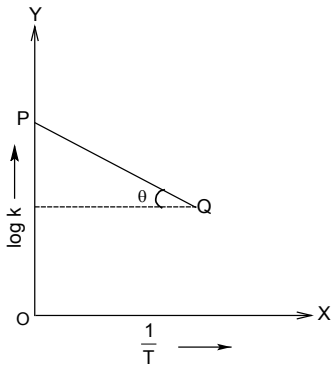
Paragraph for Question Nos. 12 to 13

Temperature has a profound influence on the reaction rate. In homogeneous thermal reactions, for every ten degree rise in temperature, the rate of reaction is doubled or tripled. The ratio, called temperature coefficient, is $\frac{k_t + 10}{k_t} \approx 2$ to 3. Arrhenius showed that the rate constant of a chemical reactions increases exponentially with temperature for a large number of reactions

12. The rate of the forward reaction A + B $\rightleftharpoons$ C + D doubles when the temperature is raised from 17°C to 27°C. The forward reaction is endothermic by an extent of 15 kJ/mole. What is the activation energy of the backward reaction?

(a) 15 kJ/mole (b) 35 kJ/mole (c) 50 kJ/mole (d) 65 kJ/mole

13. Figure shows a graph in $\log k$ vs $\frac{1}{T}$ where k is rate constant and T is absolute temperature. The straight line PQ has slope, $\tan\theta = -\frac{1}{2.303}$ and an intercept, OP = 5 on Y axis. Then, Arrhenius equation can be written as



(a) $k = 5 \times e^{-\frac{1}{2.303T}}$ (b) $k = 10^5 \times e^{-\frac{1}{2.303T}}$

(c) $k = 10^5 \times e^{\frac{1}{T}}$ (d) $k = 10^5 \times e^{-\frac{1}{T}}$

Space for rough work

Paragraph for Question Nos. 14 to 16

A certain salt (X) gives the following tests

(i) Its aqueous solution is alkaline to litmus

(ii) On strong heating it swells to give a glassy bead.

(iii) When concentrated H_2SO_4 is added to a hot concentrated solution of X, white crystals of a weak acid (Y) separate out.

14. Which of the following statements is incorrect about X?

(a) It is a hydrated compound.

(b) Its aqueous solution is used as a buffer

(c) Its aqueous solution can be titrated with HCl using phenolphthalein

(d) The glassy bead reacts with transition metal salts to give coloured metaborates

15. The hybridization of the central atom in X is/are

(a) sp (b) sp^2 (c) sp^3 (d) both b & c

16. Which of the following statements is incorrect about Y?

(a) It is a tribasic Arrhenius acid

(b) Diborane on hydrolysis produces Y.

(c) It has a layer structure in which planar units are joined by hydrogen bonds.

(d) On strong heating, it gives boric anhydride as the final product.

Space for rough work

SECTION – IV
Integer Type

This section contains 7 questions. The answer to each question is a single digit integer ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled. [+4 for correct, no negative marking]

1. A radioactive alkaline earth metal (^{224}X) disintegrates to give ^{208}Pb as the final product along with α & β particles. How many neutrons get converted into protons during this process?

2. For the reaction: $A(g)+B(g) \rightleftharpoons C(g)+D(g)$ at 25°C, $\Delta H^{o} = -29.8$ kcal and $\Delta S^{o} = -100\,cal K^{-1}$. Find the value of equilibrium constant.

3. The solubility of $B(OH)_2$ in water is 7×10^{-6} moles/litre. Calculate the pH of the buffer solution in which its solubility becomes 1.372×10^{-3} moles/litre.

4. 0.1 M solution of a weak acid is titrated with NaOH solution of same concentration. pH at half neutralization point is 5.3. pH at neutralization point will be.

5. $R_nSiCl_{(4-n)}$ on hydrolysis followed by condensation polymerization gives cross linked polymers. Find the value of n.

6. The magnitude of enthalpy of hydrogenation of benzene to cyclohexane at 298 K is given as 23 X kJ/mol and the enthalpy of combustion at 298 K for benzene, hydrogen and cyclohexane are – 3273, -286.1 and – 3924 kJ mol^{-1} respectively. Calculate the value of X.

7. A system undergoes a change by two different paths. By the first path, $W_1 = 0$, $Q_1 = 20$ kcal. By the second path, $W_2 = 0.5\ W_{max}$, $Q_2 = 18$ kcal. If the change occurred in a reversible way, what would be the maximum work in kcal?

Space for rough work

MATHEMATICS

SECTION–1 (PART– A)

Single Correct Choice Type

This section contains 7 multiple choice questions. Each of these questions has four choices (a), (b), (c) and (d) out of WHICH ONLY ONE CORRECT. [+3 for correct, –1 for wrong attempt]

1. If $ax^2 + bx + 6 = 0$ does not have two distinct real roots, then the least value of 3a + b is

   (a) 1 (b) – 1 (c) 2 (d) None of these

2. Suppose that w & z are two complex numbers such that (1 + 3i)w & (1 + 3i)z are different real numbers. The slope of the line connecting w and z in the complex plane is

   (a) 3 (b) – 3 (c) – 1/3 (d) 1/3

3. The axis of a parabola is along the line y = x and the distance of its vertex and focus from origin are $\sqrt{2}$ and $2\sqrt{2}$ respectively. If vertex & focus lie in the first quadrant, then the equation of the parabola is

   (a) $(x + y)^2 = (x – y – 2)$ (b) $(x – y)^2 = (x + y – 2)$

   (c) $(x – y)^2 = 4(x + y – 2)$ (d) $(x – y)^2 = 8 (x + y – 2)$

4. If y , z > 0 & y + z = c (const.), then minimum value of $\sqrt{\left(1+\frac{1}{y}\right)\left(1+\frac{1}{z}\right)}$ is

   (a) $\frac{c}{2}+1$ (b) $\frac{2}{c}+3$ (c) $1+\frac{2}{c}$ (d) $c/2$

Space for rough work

5. If two arithmetic means A_1, A_2, two geometric means G_1, G_2 and two harmonic means H_1, H_2 are inserted between any two numbers, then $\frac{A_1+A_2}{H_1+H_2}\times\frac{H_1H_2}{G_1G_2}=$

(a) 2 (b) 1/2 (c) 1 (d) none of these

6. The values of the parameter a for which the quadratic equation $(1 - 2a)\,x^2 - 6\,ax - 1 = 0$ and $ax^2 - x + 1 = 0$ have atleast one root in common are

(a) a = 0, a = 1/2 (b) a = 1/2, a = 2/9

(c) a = 0, a = 1/2, a = 2/9 (d) a = 2/9

7. If z is a non zero complex number satisfying $\left|z+\frac{2}{z}\right|=2$, then the maximum value of $|z|$ is

(a) $\sqrt{3}+1$ (b) $\sqrt{3}-1$ (c) $\sqrt{2}+1$ (d) $\sqrt{5}+1$

Space for rough work

Multiple Correct Choice Type

This section contains 4 multiple choice questions. Each question has four choices (a),(b), (c) and (d) out of which ONE OR MORE may be correct. [+4 for correct, no negative marking and Partial marks will be awarded for partially correct answers]

8. The equation $x^{\frac{3}{4}\left(\log_2 x\right)^2+\log_2 x-\frac{5}{4}}=\sqrt{2}$ has
(a) exactly one real solution (b) exactly two real solutions
(c) exactly three real solutions (d) exactly one irrational solution

9. If two distinct chords of a parabola $y^2 = 4ax$ passing through the point (a, 2a) are bisected by the line x + y = 1, then the length of the latus rectum can be
(a) 1 (b) 4 (c) 3 (d) 5

10. If $z_1 = a + ib$ and $z_2 = c + id$ are complex numbers such that $|z_1| = |z_2| = 1$ and $\text{Re}\left(z_1\bar{z}_2\right)=0$, then the pair of complex numbers $w_1 = a + ic$ and $w_2 = b + id$ satisfies
(a) $|w_1| = 1$ (b) $|w_2| = 1$ (c) $\text{Re}\left(w_1\bar{w}_2\right)=0$ (d) $\text{Im}\left(w_1\bar{w}_2\right)=0$

11. In a G.P, the product of the first four terms is 4 and the second term is the reciprocal of the fourth term. The sum of infinite terms of the G.P is
(a) – 8 (b) – 8 / 3 (c) 8 / 3 (d) 8

Space for rough work

SECTION – III

Paragraph Type

This section contains 2 paragraphs. Based upon the first paragraph 2 multiple choice questions and based upon the second paragraph 3 multiple choice questions have to be answered. Each of these questions has four choices (a), (b), (c) and (d) out of WHICH ONLY ONE CORRECT. [+3 for correct, –1 for wrong attempt]

Paragraph for Question Nos. 12 to 13

Let A(z_1), B(z_2) & C (z_3) are complex numbers satisfying $\left|z-i\sqrt{3}\right|=1$ & $3z_1+i\sqrt{3}=2z_2+2z_3$. Then

12. $\left|z_1-z_2\right|=$

(a) $\frac{1}{\sqrt{2}}$ (b) $\frac{1}{\sqrt{3}}$ (c) $\frac{1}{2\sqrt{3}}$ (d) $\frac{1}{\sqrt{6}}$

13. The value of $\frac{z_2-i\sqrt{3}}{z_3-i\sqrt{3}}$ =

(a) $\frac{1\pm i\sqrt{3}}{8}$ (b) $\frac{1\pm i\sqrt{41}}{8}$ (c) $\frac{1\pm i\sqrt{6}}{8}$ (d) $\frac{1\pm i\sqrt{63}}{8}$

Space for rough work

Paragraph for Question Nos. 14 to 16

A tangent is drawn at any pt. p(t) on the parabola $y^2 = 8x$ and on it is taken a pt. $Q(\alpha,\beta)$ from which pair of tangents QA & QB are drawn to the circle $x^2 + y^2 = 4$

14. The locus of the pt. of concurrency of the chord of contact AB of the circle $x^2 + y^2 = 4$ is

(a) $y^2 - 2x = 0$ (b) $y^2 - x^2 = 4$ (c) $y^2 + 2x = 0$ (d) $y^2 - 2x^2 = 4$

15. The points from which perpendicular tangents can be drawn to both the given circle and the parabola is/are

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

16. The locus of circumcentre of ΔAQB, if t = 2 is

(a) $x - 2y + 4 = 0$ (b) $x + 2y - 4 = 0$ (c) $x - 2y - 4 = 0$ (d) $x + 2y + 4 = 0$

Space for rough work

SECTION – IV
Integer Type

This section contains 7 questions. The answer to each question is a single digit integer ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled. [+4 for correct, no negative marking]

1. Let z_1, z_2, z_3 be three complex numbers such that $|z_1 - 3| = |z_2 - 3| = |z_3 - 3|$ and $\arg\left(\frac{z_3 - z_1}{z_2 - z_1}\right) = \frac{\pi}{6}$, then the value of $z_2^2 + z_3^2 - 3z_2 - 3z_3 - z_2z_3 + 17$ is.

2. If x, y, z are positive real numbers such that $x^3y^2z^4 = 7$, then $2x + 5y + 3z \geq 9\left(\frac{525}{2^k}\right)^{1/9}$, where K is equal to.

3. P_0 is the parabola $y^2 = 4x$, with vertex K(0, 0). A & B are points on P_0 where tangents are at right angles. Let C be the centroid of ΔABK. The locus of C is another parabola P_1. Now, this process is repeated with P_1, then P_2, P_3 etc. The length of latus rectum of P_4 is $\frac{L}{162}$, where L is

4. The integer value of K for which $x^2 - 2(4K-1)x + 15K^2 - 2K - 7 > 0 \; \forall \; x \in R$ is

5. Let a_1, a_2, ….., a_{10} be in A.P and h_1, h_2,……, h_{10} be in H.P. If $a_1 = h_1 = 2$ and $a_{10} = h_{10} = 3$, then the value of a_4h_7 is

6. The equation $3^{2x} + (K - 1)3^{x+1} + K = 0$ has roots of opposite signs, then the set of values of K is (0, 2/a), where a =

7. The number of real solutions of the equation $\left(\frac{9}{10}\right)^x = -3 + x - x^2$ is

Space for rough work