FIITJEE

ALL INDIA TEST SERIES

PART TEST – III

JEE (Advanced)-2020

PAPER – 1

TEST DATE: 15-12-2019

Time Allotted: 3 Hours **Maximum Marks: 186**

General Instructions:

- The test consists of total 54 questions.
- Each subject (PCM) has 18 questions.
- This question paper contains **Three Parts.**
- **Part-I** is Physics, **Part-II** is Chemistry and **Part-III** is Mathematics.
- Each **Part** is further divided into **Two Sections**: **Section-A & Section-C.**

1. ***Section–A (01 – 04, 19 – 22, 37 – 40)*** *contains 12 multiple choice questions which out of 4 options have* ***only one correct answer****. Each question carries* ***+3 marks*** *for correct answer and* ***–1 mark*** *for wrong answer.*

   Section-A (05 – 12, 23 – 30, 41 – 48) *contains 24 multiple choice questions which have* ***one or more than one correct*** *answer. Each question carries* ***+4 marks*** *for all correct answer.*

   *Full Marks : **+4** If only (all) the four option(s) is (are) chosen.*
   *Partial Marks : **+3** If all the four options are correct but ONLY three options are chosen.*
   *Partial Marks : **+2** If three or more options are correct but ONLY two options are chosen and both of which are correct options.*
   *Partial Marks : **+1** If two or more options are correct but ONLY one option is chosen and it is a correct option.*
   *Zero Marks : **0** If none of the options is chosen (i.e. the question is unanswered).*

   *Negative Marks : **–1** In all other cases.*

2. ***Section-C (13 – 18, 31 – 36, 49 – 54)*** *contains 18 Numerical answer type questions with answer XXXXX.XX and each question carries* ***+3 marks*** *for correct answer. There is no negative marking.*

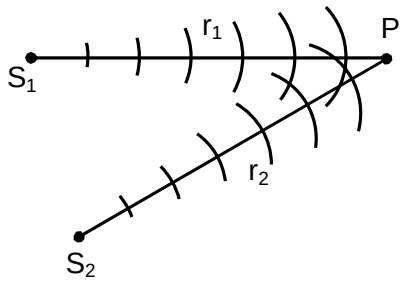
Physics

PART – I

SECTION – A
(One Options Correct Type)

This section contains **04 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.

1. Consider two point sources S_1 and S_2 which emit waves of the same frequency and amplitude A. The waves start in the same phase, and this phase relation at the sources is maintained through out the time. Consider point P at which r_1 is nearly equal to r_2 also it is given that r_1 and r_2 are sufficiently large as compared to A. After superposition of these two waves amplitude at the position P (approximately) is given by :



(Where $r = \frac{r_1 + r_2}{2} \simeq r_1 \simeq r_2$, k is angular wave number)

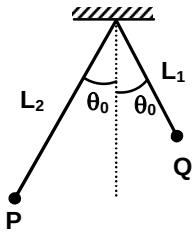
(A) $\frac{2C}{r}\cos\frac{k}{2}(r_1 - r_2)$

(B) $\frac{C}{r}\cos\frac{k}{2}(r_1 - r_2)$

(C) $\frac{2C}{r}\cos k(r_1 - r_2)$

(D) $\frac{C}{r}\cos k(r_1 - r_2)$

2. Two simple pendulum of length L_1 and L_2 are released from their extreme position in vertical plane. The angular amplitude of both the pendulums are equal. It is given that $L_1 = L_0$ and $L_2 = 25\ L_0$. The time after which the two strings become parallel to each other for the first time is



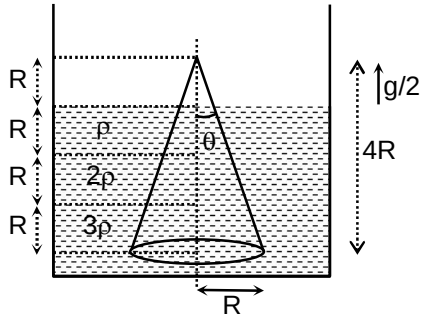
(A) $\frac{5\pi}{4}\sqrt{\frac{L_0}{g}}$

(B) $\frac{5\pi}{12}\sqrt{\frac{L_0}{g}}$

(C) $\frac{5\pi}{6}\sqrt{\frac{L_0}{g}}$

(D) $\frac{5\pi}{2}\sqrt{\frac{L_0}{g}}$

3. A solid cone is kept in three immiscible liquids of density ρ, 2ρ and 3ρ inside a container. The radius of cone is 'R' and it's height is 4R. Container is accelerated with a constant acceleration g/2 in vertically upward direction as shown. If cone is in equilibrium relative to the frame of container then density of the cone is



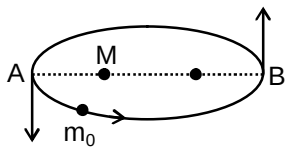
(A) $\frac{73}{24}\rho$

(B) $\frac{146}{25}\rho$

(C) $\frac{39}{16}\rho$

(D) $\frac{146}{37}\rho$

4. A satellite of mass m_0 is moving in an elliptical orbit around a planet of mass M. Planet is fixed at one of the foci of elliptical orbit. The eccentricity of elliptical orbit is e. Points A and B are called perihelion and aphelion respectively. The ratio of radius of curvature of elliptical orbit at perihelion to aphelion is



(A) e

(B) $\frac{1-e}{1+e}$

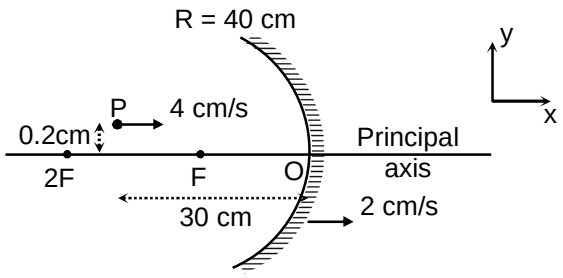
(C) $\frac{1}{e}$

(D) 1

(One or More than one correct type)

This section contains **08** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.

5. A spherical concave mirror of radius of curvature 40 cm is moving with a constant velocity 2 cm/s along positive x-axis as shown. A point object 'P' located at a distance 30 cm left to the pole of the concave mirror is also moving with a velocity of 4 cm/s along positive x-axis at a height of 0.2 cm above the principal axis as shown in figure. Then choose the correct option(s).



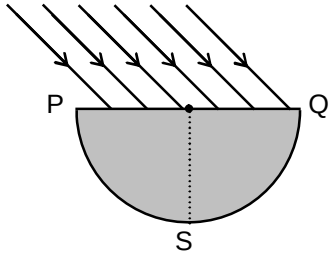
(A) The velocity of image along negative x-axis is 8 cm/s.

(B) The velocity of image along negative x-axis is 6 cm/s.

(C) The velocity of image along negative y-axis is zero.

(D) The velocity of image along negative y-axis is $\frac{2}{25}$ cm/s.

6. A parallel beam of light rays are incident on the flat surface of half cylinder made of glass as shown in the figure. The refractive index of the material of glass is $\sqrt{2}$. The angle of incidence is 45°. 'R' and 'L' are the radius and length of cylinder respectively. Choose the correct option(s).



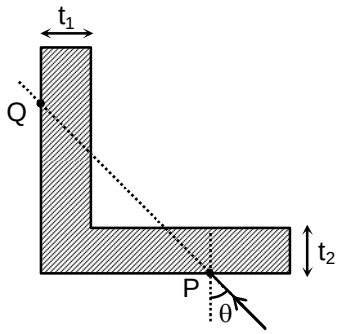
(A) Laws of refraction are valid for plane surface and spherical surface only.

(B) Surface area of cylinder from which the rays emerging out is $\frac{\pi}{2}RL$

(C) Surface area of cylinder from which the rays emerging out is $\frac{\pi}{6}RL$

(D) Let A_1 is the area of portion PS from which rays are emerging out and A_2 is from QS. Then $\frac{A_1}{A_2}=\frac{1}{5}$

7. Two glass slabs of thickness t_1 and t_2 are joined to make L shape as shown in the figure. The refractive indices of both glass slabs are same. A light ray is incident at point 'P' with an angle of incidence 'θ' as shown in the figure. It is assumed that refraction takes place from both the glass slabs. Then choose the correct option(s).

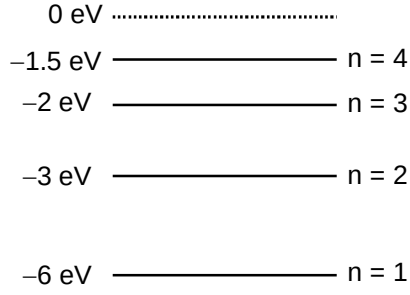


(A) emergent ray passes from Q if $t_1 = 2t_2$, $\theta = 30°$.
(B) emergent ray passes from Q if $t_1 = 2t_2$, $\theta = 45°$.
(C) emergent ray passes above the 'Q' if $t_2 > t_1$, $\theta = 45°$.
(D) emergent ray passes below the 'Q' if $t_2 < t_1$, $\theta = 45°$.

8. A He^+ ion and Li^{2+} ion both are in second excited state. Let a_{He} and a_{Li} are the acceleration of electron in their orbits and T_{He} and T_{Li} are the time periods of electron in their respective orbits. Then choose the correct option(s).

(A) $a_{Li} > a_{He}$
(B) $a_{Li} < a_{He}$
(C) $T_{Li} > T_{He}$
(D) $T_{Li} < T_{He}$

9. Consider a hypothetical atom, the energy level of atoms are given in the figure. Choose the correct option(s). (Given hc = 1240 eV-nm)



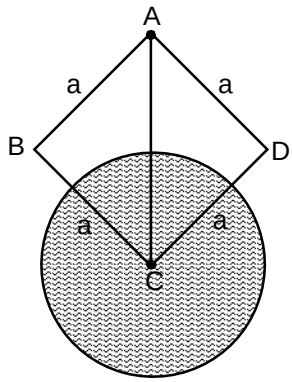
(A) An atom in the ground state gets excited by a photon and during de-excitation it emits photons, one of them has wavelength 1240 nm, then the incident photon may have wavelength of 310 nm.

(B) An atom in the ground state gets excited by a photon and during de-excitation it emits photons, one of them has wavelength 1240 nm, then the incident photon may have wavelength of 1240 nm.

(C) An atom in the ground state gets excited by a collision with an electron and during de-excitation it emits photons, one of them has wavelength 1240 nm, then incident electron must have an energy of 4eV.

(D) An atom in the ground state gets excited by a photon of 8eV then as a result an ionized atom and an electron of 2eV is obtained.

10. A square plate ABCD of mass m and side 'a' is suspended from point A in vertical plane. Another disc of same mass and $\sqrt{2}a$ diameter is attached at point C as shown in the figure. Disc can freely rotate about point C. Now square plate is slightly displaced from its equilibrium position such that axis of rotation is perpendicular to the plane of paper. Friction is absent everywhere. Choose the correct option(s).



(A) The moment of inertia of system about an axis passing through A and perpendicular to the plane of paper is $\frac{19}{6}ma^2$

(B) The moment of inertia of system about an axis passing through A and perpendicular to the plane of paper is $\frac{8}{3}ma^2$

(C) The time period of small oscillation is $2\pi\sqrt{\frac{8\sqrt{2}}{9}\frac{a}{g}}$.

(D) The time period of small oscillation is $2\pi\sqrt{\frac{19\sqrt{2}}{18}\frac{a}{g}}$.

11. Choose the correct option(s).

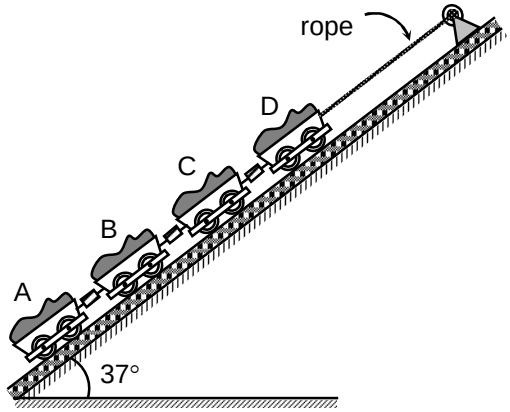
(A) If Q value of an exothermic nuclear reaction is +15.76 MeV and the kinetic energy of products of reaction is 18.24 MeV then kinetic energy of incident particles is 2.48 MeV.

(B) In a nuclear reaction, during α-decay energy released is shared between alpha particle and daughter nucleus is in the form of kinetic energy and its value for α-particle has more than that of daughter nucleus.

(C) In a decay process of a radioactive element, the activity of the sample at any instant is directly proportional to the number of undecayed nuclei present in the sample at that time.

(D) Photo electric effect supports quantum nature of light because there is a minimum frequency of light below which no photoelectrons are emitted.

12. Four ore wagon cars are held at rest on a frictionless inclined of 37° with the help of an extensible rope as shown in the figure. Any two cars are connected with an inextensible coupling. The extension in the rope is 20 cm in equilibrium and mass of each ore wagon car is 1000 kg. Now if middle coupling is break due to some problem then choose the correct options. ($g = 10\ m/s^2$)



(A) The acceleration of cars 'A' and 'B' is $6\ m/s^2$

(B) The frequency of cars 'C' and 'D' is $\frac{\sqrt{60}}{2\pi}$ Hz.

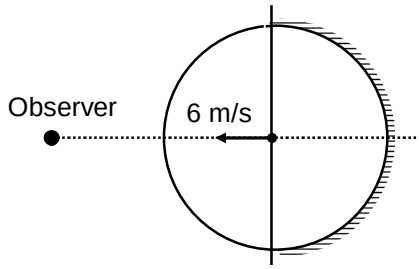
(C) The amplitude of oscillations of cars C and D is 10 cm.

(D) The amplitude of oscillations of cars C and D is 20 cm.

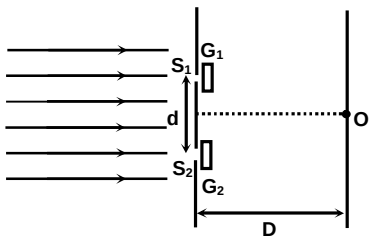
SECTION – C
(Numerical Answer Type)

This section contains **06** questions. The answer to each question is a **NUMERICAL VALUE.** For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. XXXXX.XX).

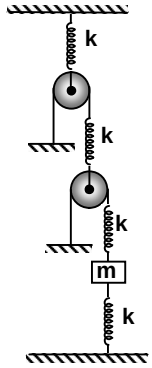
13. A spherical aquarium of radius 10 cm filled with water of refractive index 4/3 is kept as shown. One half of aquarium is silvered and other half is smooth. The thickness of aquarium is negligible. A fish is moving towards left with a velocity 6 m/s. An observer detects two images of the fish. Find the relative velocity (in m/s) between the two images of the fish as seen by the observer.



14. A parallel beam of monochromatic light of wavelength 4500 Å is incident on YDSE. Let I_0 is the intensity of incident light. Now two glass slabs G_1 and G_2 are kept infront of both slits S_1 and S_2. The refractive index of G_1 is 1.9 and for G_2 it is 1.6. The thickness of each glass slab is 15μm. It is observed that glass G_1 transmits $\frac{1}{16}$th and G_2 transmits $\frac{1}{25}$th of incident energy. If $I_0 = 8\ Watt/m^2$, then find the intensity (in W/m^2) observed at point 'O' on the screen.



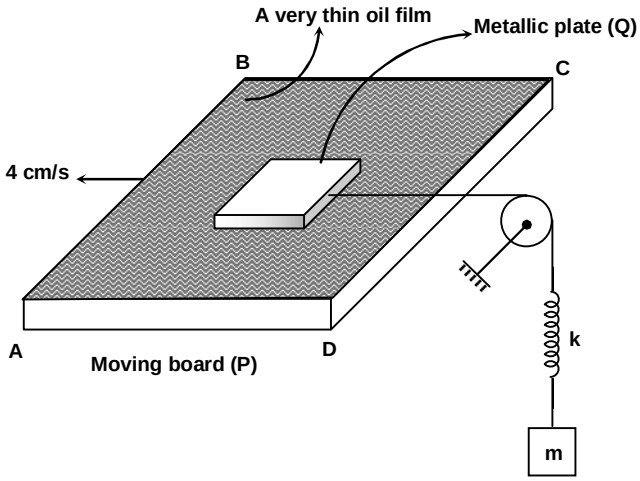
15. Four identical massless springs, two massless pulleys and a block of mass m are connected as shown and system is kept in vertical plane. Initially the system is in equilibrium. Now the block is slightly displaced from equilibrium position along a vertical line and then released. Find the time period (in sec) of small oscillation of the block if m = 6.6 kg and k = 70 N/m. (take π = 3.14)



16. Two strings AB and BC of length 1 meter and 1/2 meter respectively are joined together at end B as shown. Point B is the junction of both strings. The mass per unit length of string AB and BC are 0.16 kg/m and 0.25 kg/m respectively. A tension of 100 N is maintained in both the strings. A sinusoidal wave pulse of amplitude 2mm is produced at end 'A'. It is partly reflected and partly transmitted at joint B. Find the ratio of amplitudes of transmitted and reflected waves.

17. A rod PQ is suspended in a vertical plane. When the rod is suspended from end 'P' and slightly rotated from its equilibrium position and then released, its time period is 6 sec and now if it is suspended from end 'Q' and slightly rotated from its equilibrium position and then released, its time period is 10 sec. The moment of inertia of the rod about the axes passing through ends 'P' and 'Q' and perpendicular to the plane of oscillation are 16 kg-m^2 and 25 kg-m^2 respectively. The length of the rod PQ is 20 cm. Find the distance (in cm) between the end 'P' and the centre of mass of rod.

18. A board ABCD is moved by an external force with a constant velocity of 4 cm/sec. A thin layer of oil separates the moving board and a metallic plate (Q). The dimensions of metallic plate is 10 cm × 20 cm and thickness of oil layer is 2 mm. The metallic plate is at rest in equilibrium. A block of mass m is connected with the metallic plate by a spring of spring constant 80 N/m as shown in the figure. The coefficient of viscosity of oil is 50 poise. Find the elongation (in cm) in the spring.



Chemistry

PART – II

SECTION – A
(One Options Correct Type)

This section contains **04 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.

19. A constant current was passed for 193 sec. through KI solution oxidizing I^- ions to I_2. At the end of the experiment the liberated I_2, required 60 ml of 0.2 M solution of $Na_2S_2O_3$ for complete titration. The current passed through the solution of KI in ampere is
(A) 6 amp
(B) 8 amp
(C) 3 amp
(D) 12 amp

20. The rate constant for the reaction
$2N_2O_5 \longrightarrow 4NO_2 + O_2$
is 2×10^{-5} sec^{-1} at a given temperature. If the reaction is started with 10 mole per litre of N_2O_5, then the rate of formation of NO_2 at the moment of the reaction when concentration of O_2 is 2 mol $litre^{-1}$ is:
(A) $8\times10^{-5}\,mol L^{-1}\,sec^{-1}$
(B) $4.8\times10^{-4}\,mol L^{-1}\,sec^{-1}$
(C) $9.6\times10^{-4}\,mol L^{-1}\,sec^{-1}$
(D) $2.4\times10^{-4}\,mol L^{-1}\,sec^{-1}$

21. The final temperature of a monoatomic ideal gas $\left(\gamma = \frac{5}{3}\right)$ that is compressed reversibly and adiabatically from 40 L to 5 L at 300 K is
(A) 1200 K
(B) 800 K
(C) 600 K
(D) 400 K

22. The mass of nonvolatile solute urea need to be dissolved in 90 g water in order to decrease the vapour pressure of water by 20% is
(A) 100 g
(B) 75 g
(C) 60 g
(D) 80 g

(One or More than one correct type)

This section contains **08** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.

23. The complex ion(s) in which the central atom is sp^3 hybridised is/are
(A) $\left[Ni(CN)_4\right]^{2-}$
(B) $\left[NiCl_4\right]^{2-}$

(C) $\left[MnCl_4\right]^{2-}$

(D) $\left[Cu\left(NH_3\right)_4\right]^{2+}$

24. Acidic oxide(s) among the following oxides is/are:
(A) CrO_3
(B) N_2O
(C) B_2O_3
(D) P_4O_{10}

25. The correct statement(s) among the following statements is/are:
(A) ClO_2 molecule is paramagnetic and dimerise to form Cl_2O_4
(B) Cl_2O_6 reacts with water to form chloric acid and perchloric acid
(C) I_2O_5 oxidises CO to CO_2
(D) Liquid IF_5 conducts electricity

26. Which of the following pairs of ions can be separated by using dil. HCl?
(A) Fe^{3+}, Ag^{+}
(B) Hg_2^{2+}, Ag^{+}
(C) Hg_2^{2+}, Cd^{2+}
(D) Ag^{+}, Cu^{2+}

27. Incorrect statement(s) among the following statements is/are:
(A) $Ba(N_3)_2$ on thermal decomposition produces pure N_2
(B) $Pb(NO_3)_2$ on thermal decomposition produces N_2O_3
(C) NO_2 reacts with NaOH solution to form $NaNO_2$ and $NaNO_3$
(D) PH_3 reacts with $HgCl_2$ solution to form PCl_3

28. Which of the following reaction(s) is/are correct?
(A) $XeF_6 + 6H_2O \longrightarrow XeO_3 + 6HF$
(B) $2XeF_6 + SiO_2 \longrightarrow XeOF_4 + SiF_4$
(C) $XeO_3 + 2XeF_6 \longrightarrow 3XeOF_4$
(D) $XeF_4 + Pt \longrightarrow Xe + PtF_4$

29. Which of the following precipitate(s) is/are insoluble in yellow ammonium sulphide?
(A) HgS
(B) SnS
(C) Bi_2S_3
(D) CuS

30. The correct statement(s) among the following statements is/are
(A) In Froth Floatation process for the concentration of Galena NaCN is used as depressant for ZnS.
(B) In Goldschmidt aluminothermic process Al_2O_3 is reduced by chromium.
(C) In Mac-Arthur Forrest cyanide process silver is recovered from $Na[Ag(CN)_2]$ by adding Zn.
(D) In the Van-Arkel process impure Ti is purified by reacting impure Ti with CO.

SECTION – C
(Numerical Answer Type)

This section contains **06** questions. The answer to each question is a **NUMERICAL VALUE.** For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. XXXXX.XX).

31. 0.2 g of a non-volatile and non-electrolytic substance is present in 300 ml of a solution and the solution shows an osmotic pressure of 38 cm of Hg at 27°C. The molecular weight of the substance is (R = 0.0821 litre atm k^{-1} mol^{-1})

32. 50 ml of 1 M solution of $CuBr_2$ was electrolysed with a current of 0.965 ampere for one hour. If the volume of the solution remains constant during the electrolysis, then the normality (in N) of the remaining $CuBr_2$ solution is

33. The standard enthalpy of combustion of C_2H_6 (g) is – 1564.25 kJ mol^{-1}. Standard heat of formation of CO_2(g) and $H_2O(\ell)$ are – 395 kJ mol^{-1} and – 286 kJ mol^{-1} respectively. The heat liberated in kJ mole $^{-1}$ for the formation of 1 mole of C_2H_6(g) from its constituent elements in standard state is

34. The half-life of first order decomposition of $NH_4NO_2(aq) \xrightarrow{\Delta} N_2(g) + 2H_2O(\ell)$ is 13.86 minute at 293 K.
If 10 g of NH_4NO_2 is allowed to decompose then the time in minute required to decompose 90% of NH_4NO_2 is

35. 8g of a mixture of Na_2CO_3 and Na_2SO_4 is dissolved in water and the volume of the solution made up to 250 ml. 25 ml of this solution required 20 ml of $\frac{N}{10}H_2SO_4$ solution for neutralization. The percentage of Na_2CO_3 in the mixture is

36. At 300 K temperature and 8 atm pressure the compressibility factor for a real gas is 0.8. The volume (in litre) of 10 mole of the gas at same temperature and pressure is

Mathematics

PART – III

SECTION – A
(One Options Correct Type)

This section contains **04 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.

37. If $r \in (0, 1)$, $m \in W$ and $P = (2m + 1)r^m (1 - r)$ also $Q = 1 - r^{2m+1}$, then
(A) $P < Q$
(B) $P > Q$
(C) $P = Q$
(D) none of these

38. If α and β are the roots of equation $x^2 - a(x + 1) - b = 0$, then $\frac{\alpha^2+2\alpha+1}{\alpha^2+2\alpha+b}+\frac{\beta^2+2\beta+1}{\beta^2+2\beta+b}$ is/are
(A) 1
(B) $\frac{a+1}{b}+\frac{b+1}{a}$
(C) $a+\frac{1}{a}+b+\frac{1}{b}$
(D) none of these

39. Let $y=\sum_{r=1}^{n-1}\frac{2r^2-r(n-2)+1}{(n-r)\,{}^nC_r}$; $n \in N$, then
(A) $y = n+\frac{1}{n}$
(B) $y \geq 2$
(C) $y = n-\frac{1}{n}$
(D) $y = 2n$

40. If x, y, z > 0 are such that $\left(\frac{4x^2}{1+4x^2}-y\right)^2+\left(\frac{4y^2}{1+4y^2}-z\right)^2+\left(\frac{4z^2}{1+4z^2}-x\right)^2=0$, then
(A) $x + y = z$
(B) $x = y$
(C) $x < y < z$
(D) $x > y > z$

(One or More than one correct type)

This section contains **08** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.

41. Let $|a|, |b| < 1$, where a and b are complex number, then
(A) $\left|\frac{a-b}{1-\bar{a}b}\right| < 1$
(B) $\left|\frac{a-b}{1-\bar{a}b}\right| > 1$

(C) $\left|\frac{a-b}{1-a\bar{b}}\right| < 1$

(D) $\left|\frac{a-b}{1-a\bar{b}}\right| > 1$

42. If between two real numbers x and y an even number of arithmetic mean are inserted, such that sum of these means exceed their number by unity, then

(A) x + y can be $\frac{24}{11}$

(B) x + y can be $\frac{25}{12}$

(C) x + y can be $\frac{37}{2}$

(D) x + y can be $\frac{13}{6}$

43. From the first $(675n^6 + 2)$ natural number, if five consecutive numbers are chosen, E be event that sum of the numbers is cube of natural number and sum of middle three is a square of a natural number, then

(A) $P(E) = \frac{2}{673}$, if n = 1

(B) $P(E) = \frac{3}{673}$, if n = 1

(C) $P(E) = \frac{2n+1}{675n^2-2}$, for $n \in N$

(D) $P(E) = \frac{n+1}{675n^2-2}$, for $n \in N$

44. If a, b, c x, y, z $\in$ R and $\vec{r}_1 = a\hat{i} + b\hat{j} + c\hat{k}$, $\vec{r}_2 = x\hat{i} + y\hat{j} + z\hat{k}$ are two vectors such that $|\vec{r}_1| = 5$, $|\vec{r}_2| = 6$ and $\vec{r}_1 \cdot \vec{r}_2 = 30$, then

(A) $\frac{x}{a} = \frac{y}{b}$

(B) $\frac{x}{a} = \frac{z}{c}$

(C) x = y = z = a = b = c

(D) $\frac{a+b+c}{x+y+z} = \frac{5}{6}$

45. If $\max\{x^2 + \cos x - 1, 1 - x^2 - \cos x\} = \max\{\cos x + x^2 - 1, x^2 - 1 - \cos x\}$, $x \in \left(\frac{\pi}{2}, \frac{5\pi}{2}\right)$, then the value of x that satisfy the equation is/are

(A) number of integer values of x is 3

(B) let $x = \frac{k\pi}{2}$, $k \in I$ then k = 1, 2, 3

(C) let $x = \frac{k\pi}{2}$, $k \in I$ then n(k) = 7

(D) $x \in \left[2\pi, \frac{5\pi}{2}\right)$

46. If $x^4 - (a + 1)x^3 + x^2 + (a + 1)x - 2 = 0$, $a \in R$ have atleast two positive real roots, then **'a'** can be in the interval

(A) $a \in \left(-\infty, -1-2\sqrt{2}\right]$

(B) $a \in \left[2\sqrt{2}-1, \infty\right)$

(C) $a \in \left[-15, -1-2\sqrt{2}\right]$

(D) $a \in \left[2\sqrt{2}-1, 15\right]$

47. Let the roots of the equation $x^3 + ax + a = 0$, $a \in R - \{0\}$ be α, β and γ such that $\frac{\alpha^2}{\beta}+\frac{\beta^2}{\gamma}+\frac{\gamma^2}{\alpha}+8=0$ and $\alpha < \beta < \gamma$, then

(A) $\alpha = -1-\sqrt{5}$

(B) $\beta = 1-\sqrt{5}$

(C) $\gamma = 1+\sqrt{5}$

(D) $a = -8$

48. If 7, g_1, g_2, g_3, g_4, –7 are in G.P. and the roots of equation $x^2 + (g_1 + g_3)x + g_2g_4 = 0$ are α_1, β_1 and $x^2 + (g_2 + g_4)x + g_1g_3 = 0$ are α_2, β_2, then which of the following are correct?

(A) $g_1 + 2g_2 + 2g_3 + g_4 = 0$

(B) $g_1g_2 = g_3g_4$

(C) $\alpha_1 = 7$

(D) $\beta_2 = -7$

SECTION – C
(Numerical Answer Type)

This section contains **06** questions. The answer to each question is a **NUMERICAL VALUE.** For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. XXXXX.XX).

49. A line L in the Argand plane is a mean line for the points $w_1, w_2, w_3, \ldots\ldots, w_n$ if there are points $z_1, z_2, z_3, \ldots\ldots z_n$ on L such that $\sum_{r=1}^{n}(w_r - z_r) = 0$. The slope of a mean line for the points $32 + 170i, -7 + 64i, -9 + 200i, 1 + 27i, -14 + 43i$ which passes through the point $3i$ is/are

50. A particle moves in a sequence of unit steps. Each step along North, South, East or West with equal probability. It starts at the origin, let p be the probability that it will reach (2, 2) in less than 7 steps, then 16p is equal to

51. Let 'n' be the number of the numbers of the form 9^x where $0 \le x \le 4000$, have left most digit 9, given that 9^{4000} has 3817 digits and that its leftmost digit is 9 then n is equal to

52. Let f(x, y) is defined for $x, y \in N$ and satisfy $f(x, x) = x$,
$f(x, x + y) = \left(1+\frac{x}{y}\right) \cdot f(x, y)$,
$f(x, y) = f(y, x)$. Then f(52, 14) is

53. A is the region of the complex plane defined by p(z) such that complex numbers $\frac{z}{40}$ and $\frac{40}{\bar{z}}$ have real and imaginary parts in (0, 1), then the area of region A is (Take $\pi = 3.142$)

54. Starting at the origin a particle makes 40 moves, the nth move is of a distance of $\frac{n^2}{2}$ unit along a straight line. Its moves are in order of due east, then north, then west and then south and continues the order till 40 moves. The particle will be at a distance of _____ from origin?