Time: 3Hours

(JEE ADVANCED SAMPLE PAPER – 1)

Maximum Marks: 180

Important Instruction:

A. General: 1. This booklet is your Question Paper.
2. Blank papers, clipboards, log tables, slide rules, calculators, cameras, cellular phones, pagers and electronic gadgets are NOT allowed inside the examination hall.
3. Using a black ball point pen to darken the bubbles.

B. Question Paper Format :
The question paper consists of three parts (Physics, Chemistry and Mathematics).
Each partconsists of three sections.
Section 1.Contains 10 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONLY ONE is correct.
Section 2.Contains 5 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE or MORE are correct.
Section 3.Contains 5 questions. The answer to each question is a single–digit integer, ranging from 0 to 9 (both inclusive)

C. Marking Scheme: For each question in Section 1, you will be awarded 2 marks if your darken the bubble corresponding tothe correct answer and zero mark if no bubbles are darkened. No negative marks will be awarded for incorrect answers in this section.
For each question in Section 2, you will be awarded 4 marks if you darken all the bubble(s) corresponding to only the correct answer(s) and zero mark if no bubbles are darkened. In all other cases, minus one (–1) mark will be awarded.
For each question in Section 3, you will be awarded 4 marks if you darken the bubble corresponding to only the correct answer and zero mark if no bubbles are darkened. In all other cases, minus one(–1) mark will be awarded.

Name of the Student: …….. Class: ……

Father's Name: …….. Signature: ……

Branch Name: …… Contact No: ……

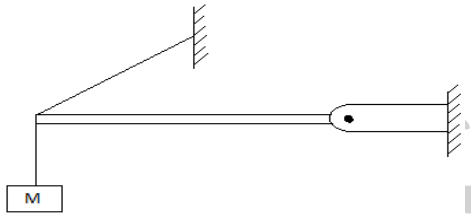
ROUGH SPACE

Byju's Classes

PHYSICS JEE ADVANCED
Section – I

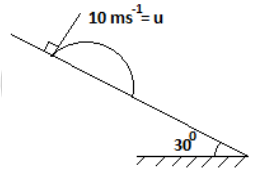
This section contains 10 multiple choice questions. Each question has four choices (a), (b), (c), (d) out of which only one is correct.

1. In the given figure, the load weighs 200N, θ=37^{0}and beam has negligible mass. Then, the tension in string and horizontal and vertical forces that pivot exerts on the beam is



(A) T= 1000N, F_H = 800N, F_V = 0
(B) T = $\frac{1000}{3}$N, F_H = 800N, F_V = 0
(C) T = 1000 N, F_H= $\frac{800N}{3}$, F_V = 0
(D) T = $\frac{1000}{3}$ N, F_H= $\frac{800\ N}{3}$, F_V = 0

2. A ball is projected from point A with a velocity 10ms^{-1} perpendicular to the plane as given. The range of the ball on plane is(in m),+



(A) $\frac{40}{3}$ (B) $\frac{20}{13}$

(C) $\frac{13}{20}$ (D) $\frac{13}{40}$

3. Force acting on a body of mass 1 kg is related to its position as, F= x^3-3x newton. It is at rest at x=1m. Its velocity at x=3 m can be,
(A) 4ms^{-1} (B) 3ms^{-1} (C) 2ms^{-1} (D) 5ms^{-1}

4. Ball A of mass 'm' moving with speed v collides head on with stationary ball B of the same mass. If e is coefficient of restitution, which of the following statements are correct?
(A) Ratio of velocities of A and B after collisions is $\left(\frac{1+e}{1-e}\right)$
(B) Ratio of final and initial velocities of A is $\left(\frac{1-e}{2}\right)$
(C) Ratio of velocities of balls A and B after collision is $\left(\frac{1-e^2}{1+e^2}\right)$
(D) Ratio of final and initial velocities of ball B is $\left(\frac{1+e}{3}\right)$

5. A uniform bar of negligible cross sectional area of length 6a and mass 8m lies on a horizontal frictionless table. Two point masses m and 2m moving in opposite directions but in the same horizontal plane with speeds 2v and v respectively strike the bar at a distance a and 2a from one end and stick to the bar after the collision. Then, after the collision,
(A) The velocity of centre of mass is 4 ms^{-1}
(B) The angular speed of the bar with the masses stuck to it is $\frac{v}{15a}$
(C) The moment of inertia of the bar with masses stuck to it about the axis passing through the centre of the bar and perpendicular to its plane is 30ma^2
(D) The total energy of the bar is $\frac{3}{25}mv^2$

Byju's classes

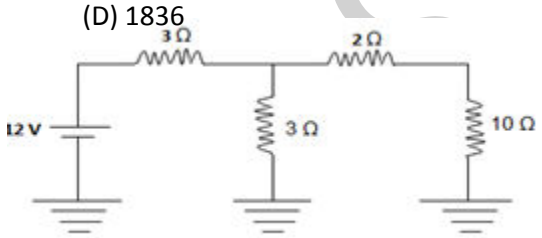
6.A stone of mass m is attached to one end of a wire of cross-sectional area A and young's modulus Y. The stone is revolved in a horizontal circle at a speed such that the wire makes an angle θ with the vertical. The strain produced in the wire will be,

(A) $\frac{mg\cos\theta}{AY}$ (B) $\frac{mg}{AY\cos\theta}$ (C) $\frac{mg\sin\theta}{AY}$ (D) $\frac{mg}{AY\sin\theta}$

7. An electron of mass m_e, initially at rest, moves through a certain distance in a uniform electric field in time t_1. A proton of mass m_p, also initially at rest, takes time $t_2$to move through an equal distance in this uniform electric field Neglecting the effect of gravity, the ratio t_2/t_1 is nearly equal to,

(A) 1 (B) $(m_p/m_e)^{1/2}$ (C) $(m_e/m_p)^{1/2}$ (D) 1836

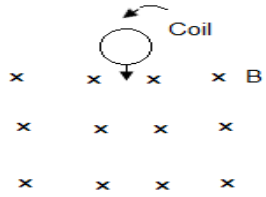
8. In the circuit shown below, the current through 10Ω resistor is,



(A) $\frac{4}{9}$A (B) $\frac{14}{9}$A

(C) $\frac{2}{3}$A (D) $\frac{5}{6}$A

9. A circular coil with its plane vertical is released from rest. It enters a region of a uniform magneticfield B at time $t=t_1$ and leaves the region at time $t=t_2$The acceleration of the coil is



(A) Less than g for all values of t.
(B) Equal to g for all values of t.
(C) Equal to g before $t=t_1$ and after $t=t_2$ but less than g between t_1 and t_2
(D) Less than g when it is entering the field and when it is leaving thefield.

10. The angle of a prism is A and one of its refracting surfaces is silvered. Light rays falling at an angle of incidence 2A on the first surface returns back through the same path after suffering reflection at the second (silvered) surface. The refractive index of the material of the prism is,

(A) 2 sin A (B) 2 cos A (C) $\frac{1}{2}\cos A$ (D) tan A

Section – II

This section contains 10 multiple choice questions. Each question has four choices (a), (b), (c), (d) out of which one or more is correct.

11. A car of mass m moving along a circular track of radius r with a speed v which varies with time t as v=kt, k being a constant Then,

(A) The instantaneous power delivered by the centripetal force is mk^3t^3/r
(B) The power delivered by the centripetal force is zero
(C) The instantaneous power delivered by the tangential force is mk^2t
(D) The power delivered by the tangential force is zero.

12. C_V and C_P denote the molar specific heat capacities of a gas at constant volume and constantpressure, respectively. Then,

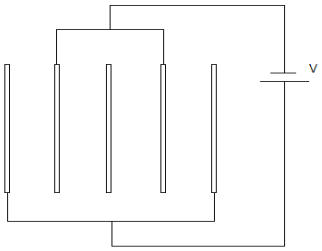
(A) C_P-C_V is larger for a diatomic ideal gas than for a monatomic ideal gas.
(B) C_P+$C_V$is larger for a diatomic ideal gas than for a monatomic ideal gas.

ROUGH SPACE

Byju's Classes

(C) C_P/C_V is larger for a diatomic ideal gas than for a monatomic ideal gas.
(D) $C_P.C_V$ is larger for a diatomic ideal gas than for a monatomic ideal gas.

13. Five identical plates, each of area A are arranged such that adjacent plates are at a distance d apart and are numbered as 1, 2, 3, 4 and 5 from left to right. The plates are connected to a battery of voltage V as shown in figure If Q_1 is the charge on the plate 1 and Q_4 on plate 4, then,



(A) $Q_1 = \frac{\epsilon_0 AV}{d}$ (B) $Q_1 = \frac{2\epsilon_0 AV}{d}$

(C) $Q_4 = \frac{-2\epsilon_0 AV}{d}$ (D) $Q_4 = -\frac{\epsilon_0 AV}{d}$

14. In a single slit diffraction experiment, the width of the slit is made double its original width. Then, the central maximum of the diffraction pattern will become,
(A) narrower (B) fainter (C) broader (D) brighter

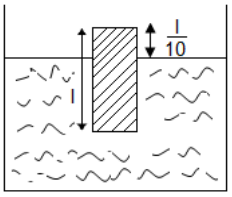
15. A tiny positively charged particle is moving head-on towards a heavy nucleus. The distance of closest approach depends upon,
(A) The number of protons in the nucleus. (B) The number of nucleons in the nucleus.
(C) The mass of the incident particle. (D) The charge and velocity of the incident particle.

SECTION – III

This section contains 5 integer type questions.

16. A particle was initially at point at height R_e from the earth's surface The work done to bring this particle to earth's surface is $\left[\frac{-x\,GM_em}{2R_e}\right]$. Find the value of X is.(m= mass of particle).

17. A uniform vertical cylinder of cross-sectional area a floats, 90% submerged in an unknown liquid inside a tank with cross-sectional area four times that of cylinder. When cylinder is pushed down gently by x, the liquid comes up by x' w.r.t. the original level. Then the ratio of x to x' will be_____.

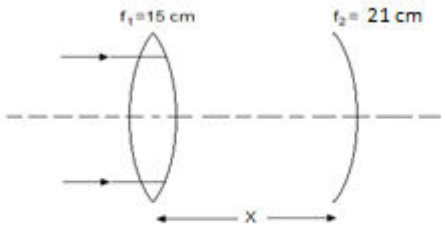


18. A thin uniform rod AB of mass M and length L is hinged at one end A to the horizontal floor. Initially it stands vertically. It is allowed to fall freely in a vertical plane. If the linear speed of B when it hits the floor is $\sqrt{\frac{xg}{L}}$,what is x?

19. A set of parallel rays are incident on the biconvex lens. If after two refractions and one reflection, final image is formed at 15cm from the lens, then the value of $\frac{x}{18}$ is_____cm.

ROUGH SPACE

Byjus Classes



20. A solid metallic sphere of radius r is charged to a voltage V. It is enclosed by a thin spherical shell of radius 2r. If q is the charge on the sphere and the shell each, the potential difference between them will be $\frac{xV}{2}$. What is x?

CHEMISTRY
Section – I

This section contains 10 multiple choice questions. Each question has four choices (a), (b), (c), (d) out of which only one is correct.

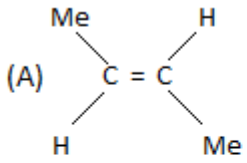
21. At $80^{\circ}C$ the vapour pressure of pure liquid 'A' is 520 mm Hg and that of pure liq 'B' is 1000 mm Hg. If mixture of both liquids from ideal solution and boils at $80^{\circ}C$ and 1 atm pressure, the mole fraction of 'A' in the liquid mixture is:

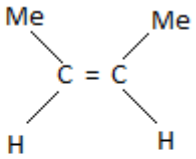
(A) 0.4 (B) 0.2 (C) 0.5 (D) 0.8

22. In the following reactions:

$$Me - CH = CH - Me \xrightarrow[CCl_4]{Br_2} A \xrightarrow{2NaNH_2} B \xrightarrow{Na/liq\ NH_3} C$$

The product (c) is

(A) 

(B) 

(C) Me - CH_2 CH_2- Me

(D) Me - C ≡ C - Me

23. 50 mL of a mixture of NaOH and Na_2CO_3 titrated with $\frac{N}{10}$HCl using phenolpthalien indicator required 50ml of HCl to decolourisephenolpthalien. At this stage methyl orange was added and addition of acid was continued.

The second end point was reached after further addition of 10ml of $\frac{N}{10}$ HCl. The amount of NaOH in the solution is:

(A) 3.2g (B) 0.16 g (C) 0.08g (D) 0.4g

24. In which of the following complex ions the central metal ion is dsp^2 hybridized?

(A) $[\mathrm{Ni(CO)_4}]$ (B) $[\mathrm{NiCl_4}]^{-2}$ (C)$[\mathrm{CuCl_4}]^{-2}$ (D) $[\mathrm{Ni(CN)_4}]^{-2}$

25. In which of the anions of silicates, two oxygen atoms are shared by other units?

(A) $Si_2O_7^{-6}$ (B) $(Si_2O_5)_n^{-2n}$ (C)$(SiO_3)_n^{-2n}$ (D) $(SiO_2)_n$

26. Which among the following statement is incorrect?

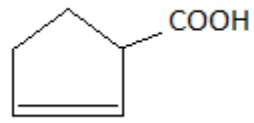
(A) with excess ammonia, chlorine gives $\mathrm{N_2}$ and $\mathrm{NH_4Cl}$

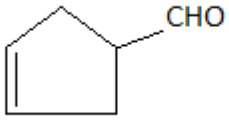
(B) Hybrolysis of $\mathrm{NCl_3}$ gives oxoacid of nitrogen

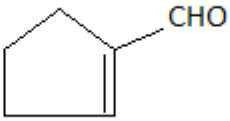
(C) Bond dissociation energy of F – F is less than Cl – Cl

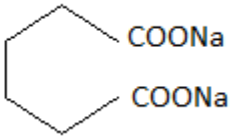
(D) Except $\mathrm{F_2}$, remaining halogens disproportionate with NaOH

27. Cyclohexene on reductive ozonalysis gives compound B. Compound 'B' on further treatment with aqueous NaOH followed by heating yields compound 'C'. The compound 'C' is;

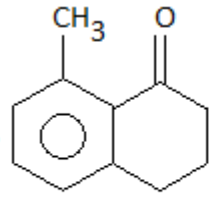
(A) 

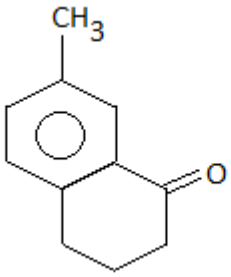
(B) 

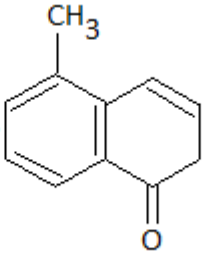
(C) 

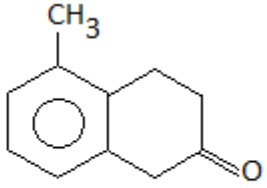
(D) 

28. Toluene on heating with succinic anhydride in the presence of anhydrous $\mathrm{AlCl_3}$ followed by reduction with Zn – Hg/Con. HCl gives a product which on heating with thionylchloride followed by heating with anhydrous $\mathrm{AICl_3}$ in$\mathrm{CS_2}$ gives major product (A), so, the product (A) is:

(A) 

(B) 

(C) 

(D) 

29. Which of the following is not paramagnetic

(A) NO (B) O_2 (C) N_2^+ (D) N_2O

30. Mark out the right combination of cell and conditions for spontaneity:

(A) $\overset{Pt\ (H_2)}{P_1}\left|\overset{HCL}{1M}\right|\overset{Pt\ (H_2)}{P_2}$: $P_1 > P_2$

ROUGH SPACE

(B) Zn $|Zn^{+2}(C_1) || Zn^{+2}(C_2) |$ Zn ; $C_1 > C_2$

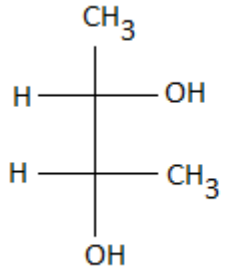
(C) Pt $(CI_2, 1\ atm)|C\bar{I}(C_1)||C\bar{I}(C_2)|\ Pt\ (CI_2\ 1\ atm);\ C_2 > C_1$

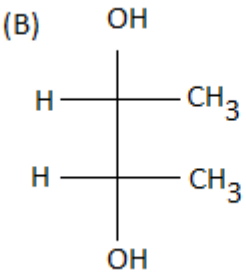
(D) Pt $(H_2, 1\ atm)|HCI\ (C_1)||HCI\ (C_2)|\ Pt\ (H_2, 1atm);\ C_1 > C_2$

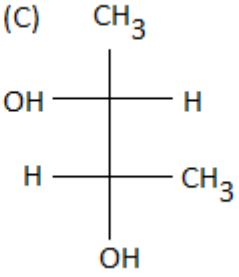
Section – II

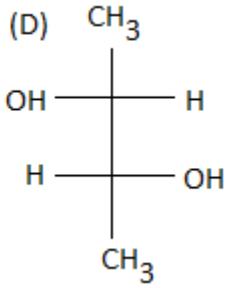
This section contains 10 multiple choice questions. Each question has four choices (a), (b), (c), (d) out of which one or more is correct.

31. Which of the following structures is/are meso – 2, 3 – butane diol

(A) 

(B) 

(C) 

(D) 

32. Which of the following compounds are formed by the oxidation of 3 – methyl butane 1, 2, 3 – triolwithHIO_4
(A) $CH_3 - CHO$ (B) $CH_3\ CO\ CH_3$ (C) HCOOH (D) HCHO

33. For the reaction $PCl_{5\ (g)} \rightleftharpoons Pcl_3(g) + Cl_2(g)$; the forward reaction at constant temperature is favoured by
(A) Adding innert gas at constant volume (B) Adding innert gas at constant pressure
(C) Adding Cl_2 at constant volume (D) Increasing volume of the container

34. Which of the following statements are correct:
(A) The flocculating value of PO_4^{-3} is less than that of SO_4^{-2}
(B) Chemisorption is multi-layered
(C) Protecting ability of lyophilic colloid is directly proportional to the Gold number
(D) Langmuir adsorption isotherm at low pressure is $\frac{x}{m} = ap$

35. Which of the following is/are not an oxide ore (s)?
(A) malachite (B) Argentite (C) pyrolusite (D) whitherite

SECTION – III

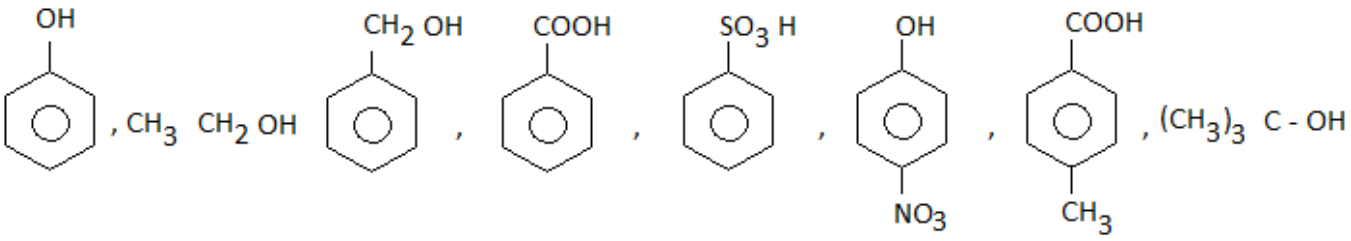
This section contains 5 integer type questions.

ROUGH SPACE

36. Hydrogen peroxide is detected by using acidified TiO_2.An orange coloured compound (B) is formed. The change in oxidation state of 'Ti' in this reaction is:

37. 5ml of a gaseous hydrocarbon $(C_x\ Hy)$ was exploded with 30 ml of oxygen. The resulting gas on cooling to room temperature is found to measure 25ml of which 10ml are absorbed by NaOH and the remainder by Pyrogallol. The value of x + y is?

38. How many of the following liberateCO_2 with$NaHCO_3$



39. Metal element 'M' of radius 50nm is crystallized in FCC format and Make cubical crystal such that face of unit cells aligned with face of cubical crystal. If total number of metal atoms of 'M' at face of cubical crystal is 6×10^{30}, then area of one face of cubical crystal is A $\times\ 10^{16}m^2$, the value of 'A' is:

40. How many of the following are mixed anhydrides?

$P_4O_{10}, CO, SO_2, ClO_2, Cl_2O, N_2O, NO_2, Cl_2O_6, CO_2, Cl_2O_7, SO_3$

MATHEMATICS
Section – I

This section contains 10 multiple choice questions. Each question has four choices (a), (b), (c), (d) out of which only one is correct.

41. Let H be a regular hexagon with two consecutive vertices (0, 0) and (1, 0). If C_i (i = 1 to 6) are the circles having centres at the vertices of H and each circle touches its adjacent circles, then the perimeter of the circle having maximum area which touches allC_i 's (i = 1 to 6), is

(A) π (B) 2π (C) 3 π (D) 4 π

42. The line x+y+2 = 0 is a tangent to a parabola y^2 = 4ax at point A, it intersect the directrix at B and tangent at vertex at C, then (AC) · (BC) =

(A) 8 (B) 4 (C) 12 (D) 16

43. The equations of a pair of opposite sides of a parallelogram are x^2–5x+6 = 0 and y^2–6y+5=0, then the equation of the diagonal having positive slope is

(A) y = 4x+7 (B) y = 4x-7 (C) 4x+y = 13 (D) 4x+y = 15

ROUGH SPACE

Byju's Classes

44. $\underset{n \to \infty}{Lt} \left\{\cos\frac{x}{2}.\cos\frac{x}{4}.\cos\frac{x}{8}. \ldots . \cos\frac{x}{2^n}\right\} =$

(A) 0 (B) 1 (C) sin x (D) $\frac{\sin x}{x}$

45. If $y = \tan^{-1}\left(\frac{4x}{1+5x^2}\right) + \tan^{-1}\left(\frac{2+3x}{3-2x}\right)$ then $\frac{dy}{dx}$ at $x = \frac{1}{5}$ is

(A) 1.5 (B) 2.5 (C) 1 (D) 10

46. If $\int \frac{\sec^2 x - 2010}{\sin^{2010} x}\, dx = \frac{f(x)}{\sin^{2010} x} + c$, then $f\left(\frac{\pi}{3}\right) =$

(A) $\sqrt{3}$ (B) $\frac{1}{\sqrt{3}}$ (C) $\frac{1}{2}$ (D) $\frac{\sqrt{3}}{2}$

47. Let f(x) be a real valued function defined on (-1, 1) and e^{-x}. $f(x) = 2 + \int_0^x \sqrt{t^4 + 1}dt$. Then the value of $f^1(0)$ is

(A) 1 (B) 0 (C) $\frac{1}{3}$ (D) 3

48. The area of the region enclosed by the curves $y = x \log x$ and $y = 2x - 2x^2$ is

(A) $\frac{5}{12}$ (B) $\frac{7}{12}$ (C) $\frac{1}{12}$ (D) not defined

49. The differential equation $y\,dx + y^2 dy = x\,dy$ and $y(1) = 1$ represents a parabola whose

(A) Vertex is (0, 0) (B) axis is x = 1

(C) length of lotus rectum is 4 (D) tangent at the vertex is x= 1

50. If the tangent at A on the curve $y=x^3$ meets the curve again at B and the gradient at B is K times the gradient at A, then the value of K is

(A) 4 (B) $\frac{1}{4}$ (C) 2 (D) $\frac{1}{2}$

Section – II

This section contains 10 multiple choice questions. Each question has four choices (a), (b), (c), (d) out of which one or more is correct.

51. Number of ways in which 200 people can be divided into 100 pairs is

(A) $\frac{(200)!}{2^{100}(100)!}$ (B) $1 \cdot 3 \cdot 5 \ldots\ldots 199$ (C) $\frac{(200)!}{(100)!}$ (D) $\left(\frac{101}{2}\right), \left(\frac{102}{2}\right). \ldots . \left(\frac{200}{2}\right)$

52. Let E and F be two independent events. The probability that exactly one of them occurs is $\frac{11}{25}$ and the probability that nine of them occurs in $\frac{2}{25}$. Then

(A) $P(E) = \frac{4}{5}$, $P(F) = \frac{3}{5}$ (B) $P(E) = \frac{1}{5}$, $P(F) = \frac{2}{5}$

Byju's Classes

(C) P(E) = $\frac{2}{5}$, P(F) = $\frac{1}{5}$ (D) P(E) = $\frac{3}{5}$, P(F) = $\frac{4}{5}$

53. $\frac{{}^{n}C_0}{n} + \frac{{}^{n}C_1}{n+1} + \frac{{}^{n}C_2}{n+2} + \text{-------} + \frac{{}^{n}C_n}{2n}$ =

(A) $\int_0^1 x^n (x-1)^{n-1} dx$ (B) $\int_1^2 x^n (x-1)^{n-1} dx$

(C) $\int_0^1 x^{n-1} (1+x)^n dx$ (D) $\int_1^2 x^{n-1} (1+x)^n dx$

54. For the function, f(x) = $Tan^{-1} x + Sin^{-1} x + Cos^{-1} x$

(A) domain is $x \in R$ (B) domain is $x \in [-1, 1]$

(C) range is $(0, \pi)$ (D) range is $\left[\frac{\pi}{4}, \frac{3\pi}{4}\right]$

55. Let $\begin{vmatrix} x & 2 & x \\ x^2 & x & 6 \\ x & x & 6 \end{vmatrix} = Ax^4 + B x^3 + C x^2 + D x + E$

(A) A+B+C+D = 0 (B) A+B+C+D = -1

(C) 5A+4B+3C+2D+E = -11 (D) 5A+4B+3C+2D+E = 11

SECTION – III

This section contains 5 integer type questions.

56. The number of integral values of m for which the equation Sin x $-\sqrt{3}$ Cos x = $\frac{4m-6}{4-m}$ has solutions is

57. The complex number Z satisfies the equation Z + |Z| = 2+8i, then the value of $|Z| - 8$ is

58. The distance of the point P(3, 8, 2) from the line $\frac{x-1}{2} = \frac{y-3}{4} = \frac{z-2}{3}$ measured parallel to the plane 3x+2y–2z+15 = 0 is

59. Let $\vec{a}, \vec{c}$ be unit vectors and $|\vec{b}|$ =4. The angle between $\vec{a}$ and $\vec{c}$ is $Cos^{-1}\left(\frac{1}{4}\right)$.Then the positive integral value of λ. Such that $\vec{b} - 2\vec{c} = \lambda\vec{a}$ is

60. If C is the centre and A, B are two points on the conic $4x^2+9y^2-8x-36y+4= 0$ such that $\angle ACB = \frac{\pi}{2}$, then $CA^{-2} + CB^{-2} + \frac{23}{36}$ =

Byju's Classes