ALLEN CAREER INSTITUTE KOTA (RAJASTHAN) path to success

DISTANCE LEARNING PROGRAMME

(Academic Session : 2015 - 2016)

LEADER TEST SERIES / JOINT PACKAGE COURSE

TARGET : JEE (MAIN) 2016

Test Type : **ALL INDIA OPEN TEST** (MAJOR) Test Pattern : JEE-Main

TEST # 01 **TEST DATE : 31 - 01 - 2016**

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	3	1	3	4	2	1	2	1	2	2	2	3	3	3	1	3	3	4	3	1
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	1	1	1	4	4	3	4	1	2	4	4	2	2	4	4	4	2	3	3	1
Que.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	3	4	4	2	3	1	4	2	2	1	3	4	4	2	4	2	1	2	3	4
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Ans.	2	3	4	4	3	1	1	3	3	3	4	4	3	2	4	2	3	2	2	3
Que.	81	82	83	84	85	86	87	88	89	90										
Ans.	2	2	3	2	2	1	2	3	3	2										

HINT – SHEET

1. Ans. (3)

Sol. $\oint \vec{E}\cdot\vec{ds} = E_0 \ell \pi r^2$

Hence, Q in $= \varepsilon_0 E_0 \pi r^2 \ell$

2. Ans. (1)

Sol. Q_0 is charge on the capacitor at $t = \infty$,

At $t = \infty$, No current in capacitor, Δv across

Capacitor $= \dfrac{v}{R_1 + R_2} R_2$

Hence $Q_0 = \dfrac{CVR_2}{R_1 + R_2}$

3. Ans. (3)

Sol. According to lenz law, for flux to remain constant loop must go away.

4. Ans. (4)

Sol. ne = I

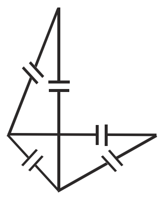
$n \times 1.6 \times 10^{-19} = 6.4 \times 10^{-3}$

5. Ans. (2)

Sol. One of the particle will at positive extreme while other at negative extreme.

6. Ans. (1)

Sol. One capacitor will be removed due to symmetry if we calculated then one of the capacitor will be removed and the remaining circuit will be

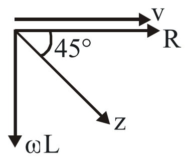


$$Ceq = C + \frac{C}{2} + \frac{C}{2} = 2C$$

7. Ans. (2)

Sol. $\frac{\omega L}{R} = \tan 45°$

$\sqrt{(\omega L)^2 + R^2} = 10$



$R = 5\sqrt{2}$

$\omega L = 5\sqrt{2}$

$L = \frac{5\sqrt{2}}{(2000\pi)}$

$L = \frac{1}{\sqrt{2} \times 200\pi}$

8. Ans. (1)

Sol. $\frac{h}{x} = \frac{500}{1} = \frac{400}{0.8}$

9. Ans. (2)

Sol. Light ray will get reflected from vertical face and finally emerge parallel to base.

10. Ans. (2)

Sol. Potential difference across 2R will be 9V. Hence remaining potential difference will be across R which is 8v.

11. Ans. (2)

Sol. Band width = 2 modulating frequency = 10kHz

12. Ans. (3)

Sol. It's a cyilic process.

Hence, Q = w [As $\Delta u = 0$]

13. Ans. (3)

Sol. $V_T \alpha (\rho - \rho_L)$

$\frac{0.2}{v_T} = \frac{18}{9} \Rightarrow v_T = 0.1 \text{ m/s}$

14. Ans. (3)

Sol. $A = A_0 e^{-bt}$

$\frac{A_0}{2} = A_0 e^{-b(3)}$

$e^{-3b} = \frac{1}{2}$ ......(i)

$A' = A_0 e^{-b(9)}$

$A' = A_0 \left(\frac{1}{8}\right)$ [from equation (i)]

15. Ans. (1)

Sol. For terminal velocity (constant velocity), acceleration of wire should be zero.

$\therefore$ $I \ell B = mg$

But $\varepsilon = B \ell v_0$

$\therefore$ $I = \frac{\varepsilon}{R} = \frac{B \ell v_0}{R}$

$\therefore$ $\left(\frac{B \ell v_0}{R}\right) \ell B = mg$

$\Rightarrow$ $v_0 = \frac{mgR}{B^2 \ell^2}$

16. Ans. (3)

Sol. $\varepsilon = B_v \ell v$

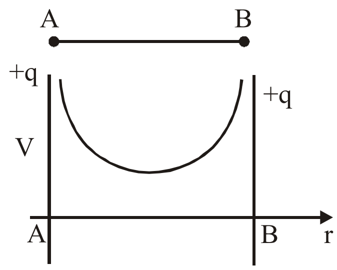
$\varepsilon = (B_H \tan \delta) \ell v$

$\varepsilon = 3 \times 10^{-4} \times \frac{4}{3} \times 0.25 \times 10 \times 10^{-2}$

$\varepsilon = 10 \times 10^{-6}$ v = 10 μV

17. Ans. (3)

Sol.



18. Ans. (4)

Sol. $V = x^2 + x \Rightarrow \frac{dv}{dt} = 2x\frac{dx}{dt} + \frac{dx}{dt}$

$\Rightarrow$ $a = (2x + 1) V = (2x + 1)(x^2 + x)$

$\therefore$ When x = 2m

$a = (2 \times 2 + 1)(2^2 + 2) = 5 \times 6 = 30 \text{ m/s}^2$.

19. Ans. (3)

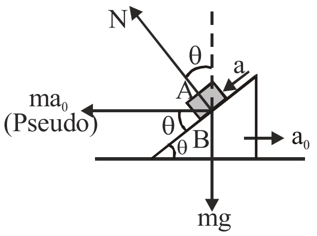
Sol. Acceleration of hero in vertical direction = 2 m/s^2

Acceleration of bullet in vertical direction = 10 m/s^2

Hence by the time bullet reaches the hero, its vertical displacement will be more than that of the hero.

20. Ans. (1)

Sol.



$ma_0 \sin\theta + N = mg \cos\theta$

$\Rightarrow N = mg\cos\theta - ma_0\sin\theta$

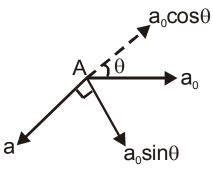
$\Rightarrow N < mg \cos\theta$

Hence, (D) is true.

$ma_0 \cos\theta + mg \sin\theta = ma$

$\Rightarrow a = g \sin\theta + a_0 \cos\theta$

Hence acceleration of A



$= \sqrt{(a - a_0\cos\theta)^2 + (a_0\sin\theta)^2} > g\sin\theta$.

21. Ans. (1)

Sol. As $N \sin\alpha = mg$

$N \cos\alpha = m\omega^2 r$

$\tan\alpha = \dfrac{g}{\omega^2 r}$

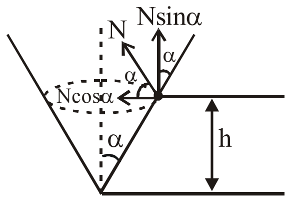
$\therefore T^2 \propto r \tan\alpha$

$\therefore T^2 \propto h \tan^2\alpha$

for constant α

$T^2 \propto h$

Thus when h increases T also increases



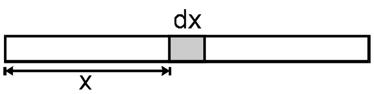
22. Ans. (1)

Sol. Final P.E. of block = Initial P.E. of block + work done by friction

$\therefore mgh' = mgh - \mu mgd$

23. Ans. (1)

Sol.

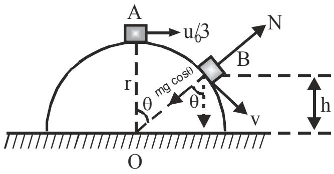


$$\therefore x_{cm} = \frac{\int_0^L \frac{K}{L} x^3 dx.x}{\int_0^L \frac{K}{L} x^3 dx} = \frac{\left.\frac{x^5}{5}\right|_0^L}{\left.\frac{x^4}{4}\right|_0^L} = \frac{4}{5}L$$

24. Ans. (4)

Sol. As at B it leaves the hemisphere,

$\therefore N = 0$



$mg\cos\theta = \dfrac{mV^2}{r}$

$mg\, h/r = \dfrac{mV^2}{r}$

$mv^2 = mgh$ ....(1)

By energy conservation between A and B

$$mgr + \frac{1}{2}m\left(\frac{u_0}{3}\right)^2 = mgh + \frac{1}{2}mv^2$$

Put u_0 and mv^2

$\therefore h = \dfrac{19r}{27}$

25. Ans. (4)

Sol. At x = 0 the phase difference should be π.

$\therefore$ the correct option is D.

Alternate solution

$y_2 = a\cos(\omega t + kx + \phi_0)$

$\therefore y = y_1 + y_2 = a\cos(\omega t - kx + \frac{\pi}{3})$

$+ a\cos(\omega t + kx + \phi_0)$

$$= 2a\cos\left[\omega t + \frac{\frac{\pi}{3} + \phi_0}{2}\right] \times \cos\left[kx + \frac{\phi_0 - \frac{\pi}{3}}{2}\right]$$

$\because y = 0$ at $x = 0$ for any t

$$\Rightarrow kx + \frac{\phi_0 - \frac{\pi}{3}}{2} = \frac{\pi}{2} \text{ at } x = 0$$

$\therefore \phi_0 = \dfrac{4\pi}{3}$. Hence $y_2 = a\cos(\omega t + kx + \dfrac{4\pi}{3})$

26. Ans. (3)

Sol. Velocity of sound in air (V) $= \sqrt{\dfrac{\gamma RT}{M}}$

$\Rightarrow V^2 \alpha T$ (in kelvin)

not $V^2 \alpha T$ (in ^0C)

Hence (B) is incorrect.

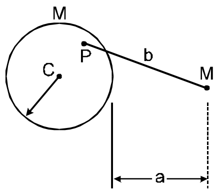
Velocity of transverse wave in a string :

$V = \sqrt{\dfrac{T}{\mu}} = V^2 \alpha T$

Hence (3) is a correct graph.

27. **Ans. (4)**

Sol. At centre



$V_c = -\dfrac{GM}{a} - \dfrac{GM}{2a}$;

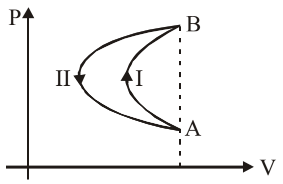
$E_c = \dfrac{GM}{(2a)^2}$;

At any point P inside $V_P = -\dfrac{GM}{a} - \dfrac{GM}{b}$

$E_P = \dfrac{GM}{b^2}$ {only due to outside mass M}

28. **Ans. (1)**

Sol. As work done in state (II) is more than in state (I)



29. **Ans. (2)**

30. **Ans. (4)**

Sol. Wein's displacement law is :

$\lambda_m .T = b$

i.e. $T \propto \dfrac{1}{\lambda_m}$

Here, λ_m becomes half.

$\therefore$ Temperature doubles.

Also $e = \sigma T^4$

$\Rightarrow \dfrac{e_1}{e_2} = \left(\dfrac{T_1}{T_2}\right)^4$

$\Rightarrow e_2 = \left(\dfrac{T_2}{T_1}\right)^4 .e_1 = (2)^4.16$

$= 16.16 = 256 \text{J m}^{-2} \text{s}^{-1}$

31. **Ans. (4)**

Sol. Theory based.

32. **Ans. (2)**

Sol. Assume total mass = 200 gm

$\therefore$ Mass of $CaCO_3$ = 100 gm

Then loss in mass = 44 gm

$\therefore$ Percentage loss = 22%

33. **Ans. (2)**

Sol. PM = dRT

$\Rightarrow 1 \times M = 10 \times 0.0821 \times 273$

$\therefore M = 224 = 2 \times A$

A = 2

34. **Ans. (4)**

Sol. (1) As non metallic character increases, acidic nature also increases.

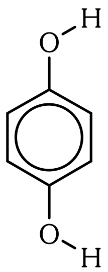
(2) $Li^+ > Mg^{2+}$

(3) Strength of hydrogen bonding.

(4) Boiling points increases with Molecular mass.

35. **Ans. (4)**

Sol. (1)



$\mu \neq 0$

(2) HI has least bond energy.

(3) In $NaHCO_3$, HCO_3^- ions are associated by hydrogen bonding

(4) Bond strength depends on 'n' & also on directional nature of orbitals.

36. **Ans. (4)**

Sol. In Solid state

PBr_5 exists as PBr_4^+ & Br^-

N_2O_5 exists as NO_3^- & NO_2^+

Na_2SO_4 exists as Na^+ & SO_4^{2-}

H_2O exist as H_2O only.

37. **Ans. (2)**

Sol. Electronic configuration of Cu(29)

$= 1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$

$\therefore m_l = 0$ will be = 2 + 2 + 2 + 2 + 2 + 1 + 2 = 13.

38. **Ans. (3)**

Sol. $XeF_6 + 3H_2O \longrightarrow XeO_3 + 6HF$

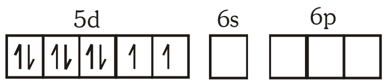
39. **Ans. (3)**

Sol. $Fe_2(SO_4)_3 \longrightarrow Fe_2O_3 + 3SO_3$.

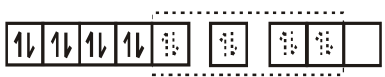
40. **Ans. (1)**

Sol. $5d^8$ configuration have higher CFSE and the complex is thus square planar and diamagnetic.

$Pt^{2+} = [Xe]4f^{14} 5d^8$



$[Pt(NH_3)_4]^{2+}$



41. Ans. (3)

Sol. The solidified copper obtained after bessemerisation is impure and contains Fe, Ni, Zn, Ag, Au etc., as impurity. It has blistered like appearance due to the evolution of SO_2 and so it is called blister copper.

42. Ans. (4)

Sol. $C \text{ (diamond)} + O_2 \longrightarrow CO_2(g)$; $\Delta H = -97.6$ kcal

$C \text{ (graphite)} + O_2 \longrightarrow CO_2(g)$; $\Delta H = -94.3$ kcal

$C \text{ (diamond)} \longrightarrow C \text{ (Graphite)}$ $\Delta H = -3.3$ kcal

Heat required to convert 12 gram diamond to graphite = 3.3

$\therefore$Heat required to convert 1 gm diamond to graphite

$= \frac{3.3}{12} = 0.275$

43. Ans. (4)

Ans. $[Ac^-] = 0.036$ M

Sol. $\underset{0.4(1-\alpha)}{HAc} \overset{Ka}{\rightleftharpoons} \underset{0.4\alpha}{H^+} + \underset{(b+0.4\alpha)}{Ac^-}$

$0.4\alpha = 2 \times 10^{-4}$

$\alpha = 5 \times 10^{-4}$

$K_a = \frac{b \times 0.4\alpha}{0.4} = 1.8 \times 10^{-5}$

$b = \frac{1.8 \times 10^{-5}}{5 \times 10^{-4}} = 0.036$

44. Ans. (2)

45. Ans. (3)

Sol. $-\frac{1}{3}\frac{d[H_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$

$\therefore \frac{-d[H_2]}{dt} = \frac{3}{2} \times \frac{0.001}{17} \frac{\text{Kmole}}{\text{hr}}$

$= \frac{3}{2} \times \frac{0.001}{17} \times 2 \text{Kg/hr}$

$= 1.76 \times 10^{-4}$ Kg/hr.

46. Ans. (1)

Sol. $P = P_B^{\circ}X_B + P_T^{\circ} X_T$

$120 = 150(X_B) + 50(1 - X_B)$

$100X_B = 70$

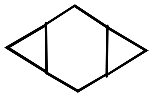
$X_B = 0.7$

$Y_B = \frac{X_B P_B^0}{P} = \frac{0.7 \times 150}{120} = 0.875$

$\frac{Y_B}{Y_T} = \frac{7}{1}$

$Y_T = 1 - 0.875 = 0.125$

47. Ans. (4)

Sol. 

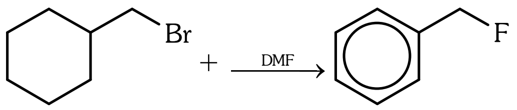
It has different molecular formula and different DU.

48. Ans. (2)

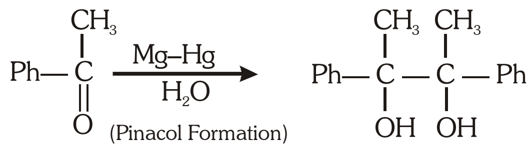
49. Ans. (2)

Sol. rate of $S_N2 \propto$ Eletrophilicity

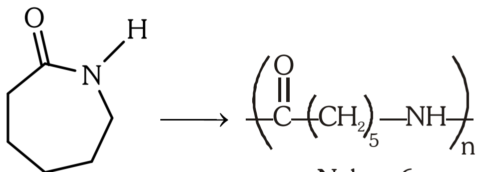
50. Ans. (1)

Sol. 

51. Ans. (3)

Sol. 

52. Ans. (4)

Sol. 

Nylon–6

53. Ans. (4)

Sol. Compound (4) is most acidic compound.

54. Ans. (2)

Sol. Glucose & fructose reducing sugars.

55. Ans. (4)

Sol. Acids which are more acidic than H_2CO_3, give CO_2 with $NaHCO_3$.

56. Ans. (2)

Sol. B is Rosenmund reaction which gives aldehyde.

57. Ans. (1)

58. Ans. (2)

Sol. Kohlrausch's law states that at Infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte whatever be the nature of the other ion of the electrolyte.

59. Ans. (3)

Sol. $E = \frac{hc}{\lambda} = h\upsilon$

60. Ans. (4)

Sol. Volume(ml) = Mass (g)

$22400 = 44$

$1120 = \frac{1120}{22400} \times 44 = 2.2$ g

61. Ans. (2)

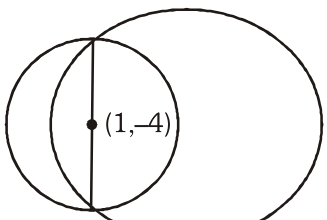
p	q	$p \wedge q$	$p \vee (p \wedge q)$
T	T	T	T
T	F	F	T
F	T	F	F
F	F	F	F

62. Ans. (3)

Common chord of given circle

$6x + 4y + (p + q) = 0$

which is diameter of $x^2 + y^2 - 2x + 8y - q = 0$



centre (1, –4)

$6 - 16 + (p + q) = 0 \quad \Rightarrow p + q = 10$

63. Ans. (4)

$\sin x + i\cos 2x = \cos x + i\sin 2x$

$\Rightarrow \cos 2x = \sin 2x$ and $\sin x = \cos x$

$\Rightarrow \tan x = 1$ and $\tan 2x = 1$

$x = \frac{\pi}{4}, \frac{5\pi}{4}, \frac{9\pi}{4} \qquad x = \frac{\pi}{8}, \frac{5\pi}{8}, \frac{9\pi}{8}$

$\because$ both equation will not have solution simultaneously, hence answer is (4)

64. Ans. (4)

$y\sin 2x - \cos x + (1 + \sin^2 x)\frac{dy}{dx} = 0$

where y = f(x)

$\frac{dy}{dx} + \left(\frac{\sin 2x}{1 + \sin^2 x}\right)y = \frac{\cos x}{1 + \sin^2 x}$

I.F. $= e^{\int \frac{\sin 2x}{1+\sin^2 x}dx} = e^{\ln(1+\sin^2 x)} = 1 + \sin^2 x$,

$y(1 + \sin^2 x) = \sin x + C; \quad (y(0) = 0)$

$\Rightarrow C = 0$

hence, $y = \frac{\sin x}{1 + \sin^2 x} \qquad y\left(\frac{\pi}{6}\right) = \frac{2}{5}$

65. Ans. (3)

For continuity at x = 0

$\lim_{h\to 0} f(0 + h) = \lim_{h\to 0} f(0 - h) = f(0)$

$\Rightarrow \lim_{h\to 0} e^{-h} + a = -3 \qquad \Rightarrow a = -4;$

For the value of a, f is diff at x = 0

66. Ans. (1)

$(2\hat{i} + \hat{j} + 2\hat{k}).(3\hat{i} - 2\hat{j} - m\hat{k}) = 0$

$\Rightarrow 6 - 2 - 2m = 0 \quad$ or $\quad m = 2$

67. Ans. (1)

$y = x^2 + 6x + 10$

$\left.\frac{dy}{dx}\right|_{(-2,2)} = -4 + 6 = 2$

Slope of normal is $-\frac{1}{2}$

$y = ax^2 + bx + \frac{7}{2}$

Passes through (1, 2)

$\Rightarrow 2 = a + b + \frac{7}{2}$ .....(1)

$\left.\frac{dy}{dx}\right|_{(1,2)} = 2a + b$

$-\frac{1}{2} = 2a + b$ .....(2)

Solving (1) and (2) a = 1, b = $\frac{-5}{2}$

68. Ans. (3)

$\sin^{-1} 2x = \cos^{-1} x$

$\sin^{-1} 2x = \sin^{-1}\sqrt{1 - x^2}$

$\Rightarrow 2x = \sqrt{1 - x^2}$

$\Rightarrow 4x^2 = 1 - x^2$

$\Rightarrow x = \pm\frac{1}{\sqrt{5}}$

$x = \frac{1}{\sqrt{5}} \left(\because x \neq -\frac{1}{\sqrt{5}}\right)$

69. Ans. (3)

$x = \frac{1}{t^3} + \frac{1}{t^2}$

$\frac{dx}{dt} = \frac{-3}{t^4} - \frac{2}{t^3}$

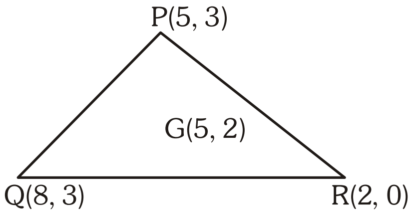
$\frac{dy}{dt} = \frac{3}{2}\left(\frac{-2}{t^3}\right) - \frac{2}{t^2}$

$$\frac{dy}{dx}=\frac{-\frac{3}{t^3}-\frac{2}{t^2}}{-\frac{3}{t^4}-\frac{2}{t^3}}$$

$$\frac{dy}{dx}=t$$

So, $x\left(\frac{dy}{dx}\right)^3-\frac{dy}{dx}=\frac{1+t}{t^3}.t^3-t=1$

70. **Ans. (3)**



71. **Ans. (4)**

Put $2x=\tan\theta$

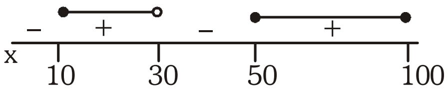
$$I=\frac{1}{2}\int_0^{\pi/4}\ell n(1+\tan\theta)d\theta$$

$$\therefore\ I=\frac{\pi}{16}\ell n2$$

72. **Ans. (4)**

$$\Delta=\left|\frac{1}{2}\left(\frac{a}{\cos\theta}\right)\left(\frac{b}{\sin\theta}\right)\right|=\left|\frac{ab}{\sin 2\theta}\right|\ge ab$$

73. **Ans. (3)**



$x\in[10, 30)\cup[50, 100]$

Probability = $\frac{71}{100}=0.71$

74. **Ans. (2)**

If each observations is multiplied by a constant k then their mean is multiplied with k and their variance is multiplied by k^2.

75. **Ans. (4)**

By using condition of tangency,

we get $4h^2 = 3k^2 + 2$

$\therefore$ Locus of P(h, k) is $4x^2 - 3y^2 = 2$ (which is hyperbola.)

Hence $e^2=1+\frac{4}{3}\ \Rightarrow\ e=\sqrt{\frac{7}{3}}$

76. **Ans. (2)**

Focus of given parabola is (5, 2).

Now any line through (5, 2) is $(y-2)=m(x-5)$

Line is tangent to given circle

$$\Rightarrow\left|\frac{0-2m}{\sqrt{1+m^2}}\right|=\sqrt{2}\ \Rightarrow 4m^2=2+2m^2\ \Rightarrow m=\pm 1$$

77. **Ans. (3)**

$$\left[\bar{a}\ \bar{b}\ \bar{c}\right]^2=\begin{vmatrix}\bar{a}\cdot\bar{a} & \bar{a}\cdot\bar{b} & \bar{a}\cdot\bar{c}\\ \bar{b}\cdot\bar{a} & \bar{b}\cdot\bar{b} & \bar{b}\cdot\bar{c}\\ \bar{c}\cdot\bar{a} & \bar{c}\cdot\bar{b} & \bar{c}\cdot\bar{c}\end{vmatrix}$$

and $\left[\bar{a}\ \bar{b}\ \bar{c}\right]=\begin{vmatrix}1 & 1 & 1\\ 1 & -1 & 1\\ 1 & 2 & -1\end{vmatrix}=4$

$$\Rightarrow\left[\bar{a}\ \bar{b}\ \bar{c}\right]^2=16$$

78. **Ans. (2)**

Required probability

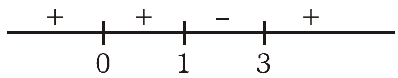
= 1 – (probability that both the digit are greater than 5)

$$=1-\frac{{}^4C_2}{{}^8C_2}=\frac{11}{14}$$

79. **Ans. (2)**

$$\frac{dy}{dx}=5x^2(x-1)(x-3)=0$$

$\therefore$ x = 0, 1, 3



Hence x = 1 is a point of maxima and x = 3 is a point of minima.

80. **Ans. (3)**

$$\lim_{x\to 0}\frac{e^x-e^{-x}-2x}{x-\sin x}$$

Using L' hospital rule

$$=\lim_{x\to 0}\frac{e^x+e^{-x}-2}{1-\cos x}=\lim_{x\to 0}\frac{e^x-e^{-x}}{\sin x}$$

$$=\lim_{x\to 0}\frac{e^x+e^{-x}}{\cos x}=2$$

81. **Ans. (2)**

$$\sum_{i=1}^{n}\sum_{j=1}^{i}\sum_{k=1}^{j}1=560$$

$$\Rightarrow\sum_{\hat{i}=1}^{n}\sum_{\hat{j}=1}^{i}j=560$$

$$\Rightarrow\sum_{\hat{i}=1}^{n}\frac{i(i+1)}{2}=560$$

$$\frac{1}{2}\left[\frac{n(n+1)(2n+1)}{6}+\frac{n(n+1)}{2}\right]=560$$

$$\Rightarrow\frac{(n)(n+1)}{12}[(2n+1)+3]=560$$

$\Rightarrow$ n (n + 1) (n + 2) = 560 × 6 = 14 · 15 · 16

$\Rightarrow$ n = 14

82. Ans. (2)

Let roots are α and β then

$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta = p^2 - 4p + 13$

$= (p-2)^2 + 9$

$\alpha^2 + \beta^2$ is minimum when p = 2

83. Ans. (3)

We have $\int_2^4 (3 - f(x))dx = 7 \Rightarrow 6 - \int_2^4 f(x)dx = 7$

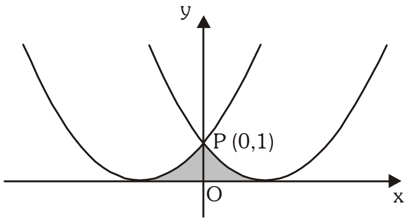
$\Rightarrow \int_2^4 f(x)dx = -1$

Now,

$$\int_2^{-1} f(x)dx = -\int_{-1}^{2} f(x)dx = -\left[\int_{-1}^{4} f(x)dx + \int_4^2 f(x)dx\right]$$

$$= -\left[\int_{-1}^{4} f(x)dx - \int_2^4 f(x)dx\right] = -(4+1) = -5.$$

84. Ans. (2)



Required area $= 2\int_0^1 (x-1)^2 dx$

$= 2\left(\frac{(x-1)^3}{3}\right)_0^1$

$= \frac{2}{3}$

85. Ans. (2)

$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

$\frac{\sqrt{3}}{2} = \frac{4 + 3 - a^2}{4\sqrt{3}} \Rightarrow a = 1$

Now $R = \frac{a}{2\sin A} = \frac{1}{2\sin\left(\frac{\pi}{6}\right)} = 1$

86. Ans. (1)

$|A - \lambda I| = 0$

$\Rightarrow \lambda^3 - 8\lambda^2 + 5\lambda + 2 = 0$

$\Rightarrow A^3 - 8A^2 + 5A + 2I = O$

87. Ans. (2)

$2Tr(A) + Tr(B) = 7$

and $Tr(A) - 2Tr(B) = 6$

$\Rightarrow Tr(A) = 4$ and $Tr(B) = -1$

88. Ans. (3)

$f(g(x)) = \sin(\cos x)$, period : 2π

$g(f(x)) = \cos(\sin x)$, period : π

$f(g(-x)) = \sin(\cos(-x)) = \sin(\cos x) = f(g(x))$

and $g(f(-x) = \cos(\sin(-x)) = \cos(-\sin x)$

$= \cos(\sin x) = g(f(x))$

Hence both are even function

89. Ans. (3)

$\sin\frac{6\pi}{5} + i\left(1 + \cos\frac{6\pi}{5}\right)$

lies in 2nd quadrant and

$$\left|\frac{1 + \cos\frac{6\pi}{5}}{\sin\frac{6\pi}{5}}\right| = \left|\cot\left(\frac{3\pi}{5}\right)\right| = \left|\cot\left(\frac{\pi}{2} + \frac{\pi}{10}\right)\right| = \tan\frac{\pi}{10}$$

2nd quadrant $\Rightarrow \pi - \frac{\pi}{10}$

90. Ans. (2)

$T_7 = {}^9C_6\left(\frac{3}{(84)^{1/3}}\right)^3 (\sqrt{3}\ln x)^6 = 729$

$\Rightarrow (\ln x)^6 = 1$

$\Rightarrow \ln x = \pm 1$

$\Rightarrow x = e, 1/e$