ANSWER KEY- XII/XIII(ASEEM/ANANT) - (PST-5) DATE : 17-01-2016

CODE-1

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

Note :-
Solutions can be *downloaded* from the website or will be displayed on the notice board !

ANSWER KEY- XII/XIII(ASEEM/ANANT) - (PST-5) DATE : 17-01-2016

CODE-2

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

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Hints & Solution

PART – I (PHYSICS)

1. The current I in the straight ....

[Sol. I is continuously decreasing, so magnetic field is downward direction is decreasing, hence direction of induced current will be clockwise.]

2. The dimensions of magnetic flux is ....

[Sol. ILB = F

$B = \frac{F}{IL} = \frac{MLT^{-2}}{IL} = MT^{-2}I^{-1}$

Magnetic flux

$\phi = BA = (MT^{-2}I^{-1})(L^2)$]

3. For the solenoids shown in the ....

[Sol. Increasing the resistance causes a decrease in the current on the left. This reduces the field strength for the solenoid $B = \mu_0 nI$. By the right-hand rule, the field through the solenoid is directed to the RIGHT. Hence, in the right-hand circuit, since there will be fewer field lines directed to the right, there is an induced electric field that will produce a current in the wires to "replace" the lost field lines. This means that current will be directed with the same orientation as the current in the left circuit... the galvanometer will deflect to the LEFT.]

4. A bar magnet with its north (N) and ....

[Sol. Magnetic field lines in right direction are decreasing, so direction of I will be clockwise. The part of the loop facing the north pole of magnet behaves as a south pole, so net force will be in right direction.]

5. A circular loop wire of radius r rotates ....

[Sol. Since area vector rotates in xy plane, therefore flux is due to By only.
At any instant $\phi(t) = \pi r^2 B_y \cos \omega t$

$|E_{ind}| = \pi r^2 B_y \omega \sin \omega t$]

6. A uniform magnetic field *B* is ....

[Sol $A_1 = l^2$

For circle; $2\pi R = 4l$

$R = \frac{2l}{\pi}$

$A_2 > A_1$

$A_2 = \pi R^2 = \pi \times \frac{4l^2}{\pi^2} = l^2 \left(\frac{4}{\pi}\right)$

$\therefore \quad \phi_2 > \phi_1$

So current flows clockwise (by lenz law)]

11. How many times will the mean ....

Sol. PV = nRT

$\Rightarrow \quad T = 16T_0$

$\Rightarrow \quad V^2_{rms} = \frac{3RT}{M} = 16\, V^2_{rms}$.]

12. An enclosed one mole of an ....

[Sol. $W = \frac{1}{2}(p_0 + 2p_0) \times (2v_0 - v_0) = \frac{3}{2} p_0v_0$

$\Delta V = \frac{3}{2} nRT\Delta T = \frac{3}{2}[4p_0p_0 - p_0v_0] = \frac{9}{2} p_0v_0$

$\Delta Q = 6p_0v_0$

$c = \frac{\Delta Q}{n\Delta T} = \frac{9p_0v_0}{\frac{3p_0v_0}{R}} = 2R$]

13. An ideal gas at pressure ....

[Sol. $T_B = T_C$

$\frac{P_BV_B}{nR} = \frac{P_CV_C}{nR}$

$P_BV_B = P_CV_C$

$2P_0 \times V_0 = P_0 \times V_C$

$V_C = 2V_0$

$T_C = \frac{P_0 \times 2V_0}{nR}$; $T_A = \frac{P_0V_0}{nR}$

$\Delta U = -\frac{3}{2}P_0V_0$

$\Delta\omega = -P_0V_0$

$\Delta Q = -\frac{5}{2}P_0V_0$]

15. Two different isotherms representing.......

[Sol. $PV = \frac{m}{M}RT$

$V \alpha m$

$V_1 < V_2 \Rightarrow \quad m_1 < m_2$]

16. One mole of an ideal gas at pressure ....

[Sol. For isothermal process $V_f = 2V_0$

$\therefore \quad P_f = P_0/2$

For isobaric process

$V_f = V_0/2$, $T_f = \frac{V_0}{2 \times 2V_0} \bullet T_0 = \frac{T_0}{4}$

For $P \propto V$ process

P–V must be straight line

$T \propto V^2 \quad \Rightarrow$ V–T must be parabolic

$P^2 \propto T \quad \Rightarrow$ P–T must be parabolic]

17. Consider a gas confined to a ....

[Sol. $P_{gas} = P_{atm} + \frac{F}{A}$]

18. 1 mole of a monoatomic gas ....

[Sol. PT=const PV = nRT, $T = \left(\frac{PV}{nR}\right)$

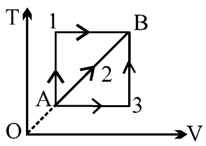
$\frac{P^2V}{nR}$=const $\quad C = \frac{3R}{2} + 2R = \frac{7R}{2}$

$P^2V = k'$; $C = 3.5$ R; $PV^{1/2} = k$

$C = C_v + \frac{R}{1-n}$; $C = \frac{3}{2}R + \frac{R}{1-\frac{1}{2}}$]

19. A given mass of a gas expands from ....

Sol.



Area under the curve $W_1 > W_2 > W_3$]

20. In an H_2 gas process, PV^2 = constant ....

Sol. $\omega = \frac{nR}{(1-2)}\Delta T = \frac{P_1V_1 - P_2V_2}{2-1} = \frac{P_1V_1 - P_2V_2}{1}$

$\Delta U = \frac{nR}{(\gamma-1)}\Delta T = \frac{nR\Delta T}{(\gamma-1)} = \frac{P_2V_2 - P_1V_1}{\gamma - 1}$

$\frac{\omega}{\Delta U} = 1 - \gamma = 1 - \frac{7}{5} = \frac{-2}{5} = -0.4$ **Ans.**]

21. The diagram shows part of the ....

[Sol. VS = 4, MS = 2.7

= MS + VS × LC = 2.7 + 0.04 = 2.74]

22. A projectile is thrown with velocity ....

[Sol. $R = \frac{20^2 \times \sin 120^\circ}{g} = 20\sqrt{3} \quad = \frac{\Delta R}{R}$

$= \frac{24U}{U} \quad \Rightarrow \Delta R = \frac{2 \times 5}{100} \times 200\sqrt{3} = 2\sqrt{3}$

$20\sqrt{3} - 2\sqrt{3} < R < 20\sqrt{3} + 2\sqrt{3}$

$\Rightarrow$ 31.1m < R < 38.1 m]

23. The dimensions of $\frac{a}{b}$ in the equation ....

[Sol. $[a] = T^2 \qquad [x] = L$

$[P] = ML^{-1}T^{-2} = \frac{T^2}{[b]L}$

$[b] = \frac{T^2}{ML^{-1}T^{-2}L} = M^{-1}T^4$

$\therefore \quad \frac{[a]}{[b]} = \frac{T^2}{M^{-1}T^4} = MT^{-2}$]

24. If energy (E), velocity (V) and time (T) ......

[Sol. [surface tension] = [force/length] = $M^1L^0T^2$

suppose [surface tension] = $E^a V^b T^c$

$\therefore M^1L^0T^{-2} = [M^1L^2T^{-2}]^a [L^1T^{-1}]^b [T]^c$

Matching dimensions of M $\Rightarrow a = 1$

Matching dimensions of L

$\Rightarrow 2a + b = 0 \Rightarrow b = -2$

Matching dimensions of T

$\Rightarrow -2a - b + c \Rightarrow c = -2$

$\therefore$ [surface tension] = $EV^{-2}T^{-2}$]

CHEMISTRY PART – II

31. Chile saltpetre is…………

Sol. Nitrogen is found in the form of nitrate

$NaNO_3$ – Indian salt petre

KNO_3 – Chile salt petre

32. Conductivity (unit Siemen's) …………

Sol. [2] $C = \frac{K[A]A}{l}$, $K = \frac{C \times l}{[A]A} = \frac{Sm}{mol\ m^{-3}\ m^2} = Sm^2 mol^{-1}$.

33. Na_2CO_3 can be manufactured …………

Sol. Solvays process

34. The solubility of the alkali……..

Sol. Solubility of alkalimetal carbonate increase down the group due to increase in ionic character

35. In the manufacture of iron …………..

Sol. [1] $\underset{\text{Impurity}}{SiO_2} + \underset{\text{Flux}}{CaO} \rightarrow \underset{\text{Slag}}{CaSiO_3}$

Lime stone decomposes to give CaO which combines with SiO_2 (Impurity) to form slag

$CaCO_3 \rightarrow CaO(s) + CO_2(g)$

36. If hydrogen electrode ….

Sol.[1]

Both electrodes are hydrogen electrode

Anode $\frac{1}{2}H_2(g) \rightarrow H^+ + e^-$

Cathode $H^+ + e^- \rightarrow \frac{1}{2}H_2(g)$

$$\frac{1}{2}H_2)_A + H^+)_C \rightarrow H^+)_A + \frac{1}{2}H_2)_C$$

$E^\circ_{cell} = 0$

$$\Rightarrow E_{cell} = 0 - \frac{0.0591}{1}\log\frac{[H^+]_A (P_{H_2})_C^{1/2}}{[H^+]_C (P_{H_2})_A^{\frac{1}{2}}}$$

$$E_{cell} = -0.059 \log\frac{10^{-6}}{10^{-3}} = -0.059 \log 10^{-3}$$

As pressure of gas is 1 bar

37. Which of the following………

Sol. [2] *Al* is highly electropositive. It can be obtained by electrolytic reduction.

38. 50 *ml* of 1 *M* oxalic acid…………..

Sol. [3] $W = \frac{126 \times 1 \times 50}{1000} \Rightarrow 6.3$

(Molecular weight of oxalic acid ⇒163)

$0.5\ gm \rightarrow \frac{6.3}{2}$

$1\ gm \rightarrow \frac{6.3}{2 \times 0.5} \times 1 \Rightarrow 6.3\ gm.$

39. In order to ……..

Sol. [4] $2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$

$3Cu_2O + \underset{\text{(From green logs of wood)}}{CH_4} \rightarrow 6Cu + 2H_2O + CO$

40. On electrolysing a …..

Sol. [3] In between dilute H_2SO_4 and platinum electrode O_2 gas evolve at anode.

41. On dissolving moderate ……

Sol. M+ (x + y) NH_3 $[M(NH_3)_x]^+ + [e(NH_3)_y]^-$

$M^+_{(am)} + e^- + NH_3(\ell) \rightarrow MNH_{2(am)} + 1/2\ H_2(g)$

Due to free electron, liquid ammonia becomes paramagnetic.

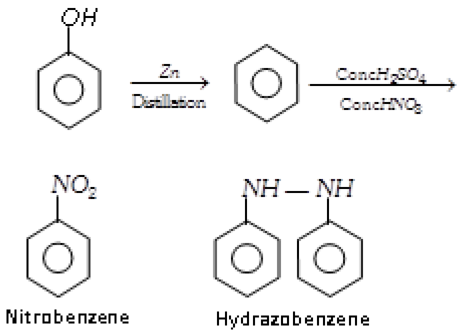
42. When 9.65 coulombs …….

Sol. [1] $W_{Ag} = \frac{E_{Ag} \times Q}{96500} = \frac{108 \times 9.65}{96500}$

$= 1.08 \times 10^{-2}\, gm = 10.8\, mg$

44. Phenol $\xrightarrow[\text{Distillation}]{Zn} A \xrightarrow[\text{Conc. } HNO_3]{\text{Conc. } H_2SO_4} B \xrightarrow[NaOH]{Zn} C$ ………..

Sol.



45. When lead storage battery is charged……..

Sol. Lead storage batteries used is automobiles (Cars/bikes)

Anode : Pb(s)

Cathode : PbO_2(s)

H_2SO_4(conc.) about 38% sol. of H_2SO_4 is taken.

Pb(s) + PbO_2 + $4H^+$ + 2(aq) $2PbSO_4$(s) + $2H_2O(\ell)$

E_{cell} = 2.05 V

During the working of the cell discharge H_2SO_4 will be consumed so it's conc in the solution hence density of the solution will decrease during charging of the cell $PbSO_4$ will get converted into Pb(s) and, PbO_2(s) and H_2SO_4 will be produced.

46. A solution containing one mole …………..

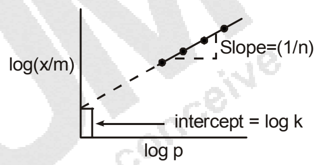
Sol. [3] A cation having highest reduction potential will be reduced first and so on. However, Mg^{2+} in aqueous solution will not be reduced $\left(E^0_{Mg^{2+}/Mg} < E_{H_2O/\frac{1}{2}H_2 + OH^-}\right)$. Instead water would be reduced in preference.

47. For the adsorption of a …..

Sol. The constant k and n can be determined as explained below : Taking logarithms on both sides of

Eq. (x/m) = $kp^{1/n}$ we get

log (x/m) = logk + (1/n) log p.



48. In this reaction, dilute H_2SO_4 …

Sol. When catalysts and reactants are in same phase then the process is said to be homogeneous catalysis and

Eg : (i)

$\underset{\text{Sucrose}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{dil.\, H_2SO_4} \underset{\text{Fructose}}{C_6H_{12}O_6\,(aq)} + \underset{\text{Glucose}}{C_6H_{12}O_6(aq)}$

49. Electrode potential ……………

Sol. [1] $E^o_{\text{cell}} = E^o_{\text{cathode}} - E^o_{\text{anode}} = 0.34 - (-0.76) = 1.10\ V$.

51. Primary and secondary alcohols ……

Sol. [1] $\underset{1^o \text{ alcohol}}{R\text{ - }CH_2OH} \xrightarrow{Cu} R - CHO + H_2$

52. The correct name of……

Sol Correct formula of potassium ferrocyanide Isomerise

53. Amongst $Ni(CO)_4$, $[Ni(CN)_4]^{2-}$ ………

Sol. $Ni(CO)_4$ – sp^3 – no unpaired e^-

$[ni(CN)_4]^{2-}$ - dsp^2 no unpaired e^-

$[NiCl_4]^{2-}$ sp^3 – 2 unpaired e^-

54. Cuprammonium ion…….

Sol.[2] Copper complexes usually involve with four co-ordination number and have square planar in shape.

$[Cu(NH_3)_4]^{2+}$ - central atom is in dsp^2 hybridisation as NH_3 being strong field ligand promotes one e^- to higher energy orbital.

55. In the following reaction '*A*' is……………….

Sol. $C_2H_5MgBr + H_2\underset{\diagdown O \diagup}{C - CH_2} \xrightarrow{H_2O}$

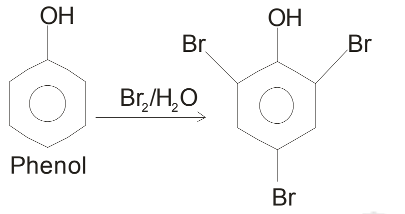
$\underset{\substack{(A)\\ n\text{-butyl alcohol}}}{C_2H_5CH_2CH_2OH} + MgBr(OH)$

56. Types of isomerism shown by …………….

Sol. [4] NO_2 is ambident and can be linked either to N -side as $(-NO_2)$ or to O -side as $(-ONO)$. Also NO_2 in coordination sphere can be replaced by counter ion Cl^-

57. Phenol is treated with ………………..

Sol.



2,4,6 tribromophneol

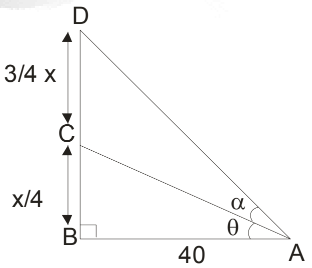
60. The reaction, water …………….

Sol. [3] $\underbrace{CO + H_2}_{\text{water gas}} + H_2 \xrightarrow[672\ K,\ 200\ atm]{Cr_2O_2\ /\ ZnO} CH_3OH$

PART- III (MATHS)

61. The upper $\left(\frac{3}{4}\right)$th portion of ……….

Sol.



Let height of tower be x

In ΔABD

$\tan(\theta + \alpha) = \frac{x}{40}$

in ΔABC

$\tan\theta = \frac{x}{160}$

$\tan\alpha = \tan(\theta - \alpha) - \theta)$

$$\frac{\frac{x}{40} - \frac{x}{160}}{x^2} = \frac{3}{5} \quad \left(\because \tan\alpha = \frac{3}{5}\right)$$

$$\frac{\frac{x}{40} - \frac{x}{160}}{1 + \frac{x^2}{40 \times 160}} = \frac{3}{5}$$

On solving

$6400 + x^2 = 200x$

$X^2 - 200x + 6400 = 0$

Solve and get

X = 40

62. If a, b, c are in H.P. …………….

Sol. [1] b = H.M. of a and c < A. M. of a and c (as a and c are distinct)

$\Rightarrow b < \frac{a+c}{2} \Rightarrow b - c < a - b \Rightarrow \frac{1}{b-c} > \frac{1}{a-b}$

63. The coordinates of the …………………

Sol. [1]

Any point on the parabola is $(x, x^2 + 7x + 2)$

Its distance from the line $y = 3x - 3$ is given by

$$P = \left|\frac{3x - (x^2 + 7x + 2) - 3}{\sqrt{9+1}}\right| = \left|\frac{x^2 + 4x + 5}{\sqrt{10}}\right| =$$

$\frac{x^2 + 4x + 5}{\sqrt{10}}$ (as $x^2 + 4x + 5 > 0$ for all $x \in R$)

$\frac{dP}{dx} = 0 \Rightarrow x = -2$

The required point $\equiv (-2, -8)$.

64. If z_1 and z_2 are ………

Sol [4] $|z_1 - z_2|^2 = |z_1|^2 + |z_2|^2 - 2|z_1| . |z_2| \cos\theta$, where $\theta = |\arg z_1 - \arg z_2|$.

Hence for the given relation $\theta = 0$

$\Rightarrow \arg z_1 - \arg z_2 = 0$.

65. From a moving point …………….

Sol **3**

Clearly PO is the diameter of circumcircle.

Hence locus of circumcentre is $x^2 + y^2 = 1$.

66. Let a, b and c be ………………

Sol. **[3]**

$a + b + c = 6 \Rightarrow a + \frac{b}{2} + \frac{b}{2} + \frac{c}{3} + \frac{c}{3} + \frac{c}{3} = 6$

Now by applying A.M. ≥ G.M., we get

$$\frac{a + \frac{b}{2} + \frac{b}{2} + \frac{c}{3} + \frac{c}{3} + \frac{c}{3}}{6} \geq \left(a.\frac{b^2}{4}.\frac{c^3}{27}\right)^{1/6}$$

$$\Rightarrow 1 \geq \left(\frac{ab^2c^3}{108}\right)^{1/6} \Rightarrow ab^2c^3 \leq 108 .$$

67. If normal drawn at …………..

Sol. (B) $P \equiv (t_1^2, 2t_1)$; $Q \equiv (t_2^2, 2t_2)$

$\Rightarrow t_2 = -t_1 - \frac{2}{t_1} \Rightarrow t_1^2 + t_1t_2 + 2 = 0$

$\Rightarrow t_2^2 - 8 \geq 0$ as $t_1 \in R$

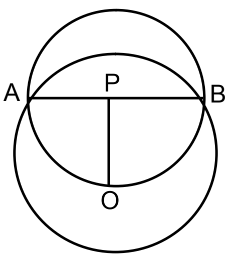
$\Rightarrow t_2^2 \geq 8$. Now $OQ^2 = t_2^4 + 4t_2^2 \geq 64 + 32 = 96$

$\Rightarrow OQ \geq 4\sqrt{6}$

68. A circle C_2 passes ……..

Sol. **1**

Let the radius of the circle be r.



Clearly AP=BP=OP=r

$\Rightarrow AP^2 + OP^2 = OA^2 = 2$

$\Rightarrow AP = 1 \Rightarrow r = 1$

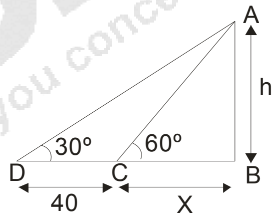
69. For a complex …………….

Sol. [2] z lies on the line segment joining the complex numbers –1 and 1 .

70. A person standing on the …………..

Sol. Let height of tower be x

In ΔABC



$\frac{h}{x} = \tan 60°$

$h = \sqrt{3}x$

In ΔABD

$\frac{h}{x+40} = \tan 30°$

$\sqrt{3}h = x + 40$

From (1) and (2)

$3x = x + 40 \Rightarrow 2x = 40$ $x = 20$

71. The value of ………

Sol. **[3]** $\frac{1}{6.10} + \frac{1}{10.14} + \frac{1}{14.18} + \ldots \infty$

$= \frac{1}{4}\left[\frac{4}{6.10} + \frac{4}{10.14} + \frac{4}{14.18} + \ldots \infty\right]$

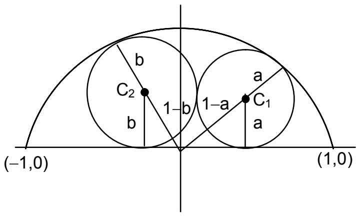
$= \frac{1}{4}\left[\left(\frac{1}{6} - \frac{1}{10}\right) + \left(\frac{1}{10} - \frac{1}{14}\right) + \left(\frac{1}{14} - \frac{1}{18}\right) + \ldots \infty\right]$

$= \frac{1}{4} \times \frac{1}{6} = \frac{1}{24}$.

72. Two circles of radii 'a' ....

Sol **1**

Let centres of the circles be C_1 and C_2



$\Rightarrow C_1$ is $(\sqrt{1-2a}$, a) and C_2 is

$(\sqrt{1-2b},\ b)$

$\Rightarrow C_1C_2 = a + b = a + \frac{1}{2}$

$\Rightarrow 1 - 2a + \left(a-\frac{1}{2}\right)^2 = \left(a+\frac{1}{2}\right)^2$

$\Rightarrow a = \frac{1}{4}$.

73. If one end of the diameter ....

Sol. [1]

Let other end of diameter (h, k)

Hence centre is $\left(\frac{3+h}{2}, \frac{k+4}{2}\right)$. This circle touches x-axis means r = $\frac{k+4}{2}$

$= \sqrt{\left(\frac{3+h}{2}-3\right)^2 + \left(\frac{k+4}{2}-4\right)^2}$ gives the equation of parabola.

74. Let r^{th} term of a series ....

Sol. T_r can be written as

$$T_r = \frac{r}{\left(r^2-1\right)^2 - r^2} = \frac{1}{2}\left(\frac{1}{r^2-1-r} - \frac{1}{r^2-1+r}\right)$$

$$\sum_{r=1}^{\infty} T_r = \frac{1}{2}\sum_{r=1}^{\infty}\left(\frac{1}{r^2-1-r} - \frac{1}{r^2-1+r}\right)$$

$$= \frac{1}{2}\left[(-1-1) + \left(1-\frac{1}{5}\right) + \left(\frac{1}{5}-\frac{1}{11}\right) + \left(\frac{1}{11}-\frac{1}{19}\right) + ...\right]$$

$$\left(\text{as } \lim_{r\to\infty}\frac{1}{r^2-1+r} = 0\right)$$

$= -\frac{1}{2}$.

75. The line x + y = 5 ....

Sol. Since AB is fixed and AC is perpendicular to BC. So, locus of C is a circle whose diameter is AB. So, family of circles passing through AB is

$$x^2 + y^2 - 6x - 8y + 21 + \lambda(x + y - 5) = 0$$

$$\Rightarrow x^2 + y^2 - (6-\lambda)x - (8-\lambda)y + 21 - 5\lambda = 0$$

So, centre is $\left(\frac{6-\lambda}{2}, \frac{8-\lambda}{2}\right)$

Since AB is diameter so centre must lie on AB

$$\Rightarrow \frac{6-\lambda}{2} + \frac{8-\lambda}{2} = 5 \Rightarrow \lambda = 2$$

$\therefore$ Locus is $x^2 + y^2 - 4x - 6y + 11 = 0$.

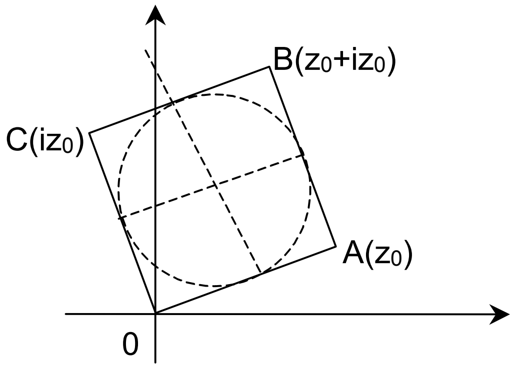
76. Consider a square ....

Sol. [2]

Clearly mid-point of OB is one centre of the circle and radius is equal $\frac{|z_0|}{2}$

$\Rightarrow$ Required equation is ;

$$\left|z - \frac{z_0}{2}(1+i)\right| = \frac{|z_0|}{2}$$



77. A tower stands at ………………………

Sol. In the Δ AOB, $\angle$ AOB = 60°, and $\angle$OBA = $\angle$ OAB (since OA =

OB = AB radius of same circle). $\therefore$ Δ AOB is a equilateral

triangle. Let the height of tower is h m. Given distance between two point A & B lie on boundary of circular park, subtends an angle of 60° at the foot of the tower AB i.e. AB = a. A tower OC stands at the centre of a circular park. Angle of elevation of the top of the tower from A and B is 30°. In Δ OAX

$\therefore \angle OBA = \angle AOB = \angle OAB = 60°$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{a} \Rightarrow h = \frac{a}{\sqrt{3}}$

78. The centre of the circle ……..

Sol. **2**

Centre of the required circle is the reflection of the point (0, 0) in the line y = mx + m.

Let C (h, k) be the centre of the reflected circle

$\Rightarrow \frac{k}{h} = -\frac{1}{m}$ ……(1)

And $\frac{k}{2} = m\frac{h}{2} + m$ ……(2)

$\Rightarrow$ k = m(–km) + 2m $\Rightarrow$ k = $\frac{2m}{1+m^2}$

$\therefore$ C (h, k) is $\left(-\frac{2m^2}{1+m^2}, \frac{2m}{1+m^2}\right)$.

79. The value of the ……..

Sol. [3]

$t_n = (n+1)\left(n+\frac{1}{\omega}\right)\left(n+\frac{1}{\omega^2}\right)$

$= n^3 + n^2\left(\frac{1}{\omega^2}+\frac{1}{\omega}+1\right)+n\left(1+\frac{1}{\omega^2}+\frac{1}{\omega}\right)+1$

$= n^3 + n^2(\omega + \omega^2 + 1) + n(\omega + \omega^2 + 1) + 1$

$= n^3 + 1$

$\therefore S_n = \sum_{r=1}^{n} t_r = \sum_{r=1}^{n}(r^3+1) = \frac{n^2(n+1)^2}{4} + n$.

80. If at x = 1, y = 2x …………….

Sol. [1]

For x = 1, y = a + b + c.

Tangent at (1, a + b + c) is
$y-(a+b+c) = (2a+b)(x-1)$

$\Rightarrow$ y = (2a + b)x + c – a

Comparing with y =2x, c = a, b = 2(1 – a)

Which are true for choice (A) only.

81. The point of intersection ……

Sol. **4**

Let (h, k) be point of intersection of the tangents

Then equation of chord of contact is xh + yk = 10

Compare this with x +y =2

$\frac{h}{1} = \frac{k}{1} = \frac{10}{2} \Rightarrow h = 5; k = 5.$

82. If normals are drawn form ……..

Sol. 3

Equation of normal:

$y = mx - 2am - am^3$

Put y = 0

We get $x_1 = 2a + am_1^2$

$x_2 = 2a + am_2^2$

$x_3 = 2a + am_3^2$

where x_1, x_2, x_3 are the intercepts on the axis of he parabola, The normal passes through (h,k)

$\Rightarrow am^3 + (2a - h)m + k = 0$

$m_1 + m_2 + m_3 = 0$

$m_1 m_2 + m_2 m_3 + m_3 m_1 = \frac{2a - h}{a}$

$$\Rightarrow m_1^2 + m_2^2 + m_3^2 = (m_1 + m_2 + m_3)^2 - 2(m_1m_2 + m_2m_3 + m_3m_1) = -2\frac{(2a - h)}{a}$$

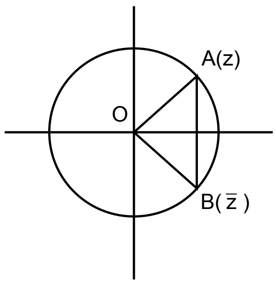
$\Rightarrow x_1 + x_2 + x_3 = 6a - 2(2a - h) = 2(h + a)$

83. If z is a complex number ……..

Sol **1**

$|z - \bar{z}|$ = straight line AB

while $|z|(\arg z - \arg \bar{z})$ = Arc AB



$\therefore |z - \bar{z}| \leq |z|(\arg z - \arg \bar{z})$

84. If a, b, c are in A.P a, x, …….

Sol. 1

a, b, c are in A.P. $\Rightarrow 2b = a + c.$

a, x, b are in G.P. $\Rightarrow x^2 = ab$

b, y, c are in G.P. $\Rightarrow y^2 = bc$

$\Rightarrow 2b = \frac{x^2}{b} + \frac{y^2}{b} \Rightarrow 2b^2 = x^2 + y^2$

Hence in A.P. .

85. Let P be any moving ………………..

Sol. **1**

Let P be $(1 + \sqrt{2}\cos\theta, \sqrt{2}\sin\theta)$ and C is (1, 0).

Circum centre of triangle ABC lies on midpoint of PC

$\Rightarrow 2h = 1 + \sqrt{2}\cos\theta + 1$ and $2k = \sqrt{2}\sin\theta$

$\Rightarrow [2(h - 1)]^2 + (2k)^2 = 2$

$\Rightarrow 2(h - 1)^2 + k^2 - 1 = 0 \Rightarrow 2x^2 + 2y^2 - 4x + 1 = 0.$

86. The parametric …………

Sol. [4]

No choice among (A), (B), (C) is giving all points on parabola $y^2 = x$

87. If z_1 and z_2 are two …………..

Sol. [1] We have $|z_1| = |z_2| + |z_1 - z_2|$

$\Rightarrow |z_1 - z_2|^2 = (|z_1| - |z_2|)^2$

$\Rightarrow |z_1|^2 + |z_2|^2 - 2|z_1|\,|z_2| \cos(\theta_1 - \theta_2) = |z_1|^2 + |z_2|^2 - 2|z_1|\,|z_2|$

$\Rightarrow \cos(\theta_1 - \theta_2) = 1 \Rightarrow \theta_1 - \theta_2 = 0 \Rightarrow \arg(z_1) - \arg(z_2) = 0 \Rightarrow \frac{z_1}{z_2}$ is purely real

$\Rightarrow \text{Im}\left(\frac{z_1}{z_2}\right) = 0$.

88. If length of a focal chord …………

Sol. 3

Length of focal chord will be $t^2 + 1 + \frac{1}{t^2} + 1 = \frac{25}{4}$

$\Rightarrow t + \frac{1}{t} = \pm \frac{5}{2}$

$\Rightarrow t = \pm 2$. Since slope is positive, so t = 2 and end points will be (4, 4), $\left(\frac{1}{4}, \ -1\right)$

Slope is $\frac{4}{3}$.

89. The equations of the………….

Sol **1**

Common tangents are easily find with the help of given alternative.

90. AB is a vertical pole with ………………

Sol.

BD = AB = 7 + x

Also AB = x tan 60º $= x\sqrt{3}$

$\therefore \ x\sqrt{3} = 7 + x$

$x = \frac{7}{\sqrt{3} - 1}$

$AB = \frac{7\sqrt{3}}{2}(\sqrt{3} + 1)$