Model Answer / Suggestive Answer

B.Sc. (First Semester) Exam. 2013
(Forestry)
Paper Code – AS-2919
Sub:– Basic Mathematics

Q.1 (i). $i^{99} = i^{98} \cdot i$
$= (i^2)^{49} \cdot i$
$= (-1)^{49} \cdot i = \underline{\underline{-i}}$

(ii). $1+\omega+\omega^2 = 0$

(iii). $a_n = a+(n-1)d$

(iv). Three no. in an A.P. are $a-d, a, a+d$.

(v). $\because \tan\theta = \dfrac{\sin\theta}{\cos\theta}$ then $\cot\theta = \dfrac{1}{\tan\theta} = \dfrac{\cos\theta}{\sin\theta}$

(vi). $\because \sin\theta = \frac{3}{5}$ then $\cos\theta = \sqrt{1-\sin^2\theta}$
$= \sqrt{1-(3/5)^2} = \sqrt{16/25}$
$= 4/5$

(vii). mid point co-ordinate

$$x = \frac{x_1+x_2}{2}, \quad y = \frac{y_1+y_2}{2}$$

(viii). $d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ or $\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$

(ix). If $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$ then $A' = \begin{bmatrix} 2 & 4 \\ 3 & 5 \end{bmatrix}$

(x). adj A = Transpose of cofactor matrix.

P.T.O.

Q.2:- (i) Let $z = 4-3i$

then multiplicative inverse of $z = 1/z$

$$= \frac{1}{4-3i} \times \frac{4+3i}{4+3i}$$

$$= \frac{4+3i}{16-9i^2} = \frac{4+3i}{25}$$

$$= \frac{4}{25} + i\,\frac{3}{25}$$

(ii) Let $z = \sqrt{5}-3i$

then multiplicative inverse of $z = \frac{1}{z}$

$$= \frac{1}{\sqrt{5}-3i} \times \frac{\sqrt{5}+3i}{\sqrt{5}+3i}$$

$$= \frac{\sqrt{5}+3i}{5-9i^2} = \frac{\sqrt{5}+3i}{5+9}$$

$$= \frac{\sqrt{5}}{14} + i\,\frac{3}{14}$$

Q.3. Let $z = -2+i2$

Comparing with $z = x+iy$

$x = -2,\ y = 2$

then modulus of $z = |z|$

$$= \sqrt{x^2+y^2}$$

$$= \sqrt{(-2)^2+2^2} = \sqrt{8}$$

$$= 2\sqrt{2}$$

and argument of $z = \tan^{-1}(y/x)$

$$= \tan^{-1}\left(\frac{2}{-2}\right)$$

$$= \tan^{-1}(-1)$$

$$= \tan^{-1}\left(\tan\frac{3\pi}{4}\right)$$

$$= 3\pi/4$$

P.T.O.

Q.4:- Let first of a G.P. be a and common ratio be r

Given $r = 3$, $S_n = 728$, $l = 486$

$\because$ last term $(l) = ar^{n-1}$

$$486 = ar^{n-1}$$

$$\Rightarrow 486 = a \cdot 3^{n-1} \longrightarrow ①$$

and $S_n = \dfrac{a(r^n - 1)}{r-1}$ $(\because r > 1)$

$$728 = \frac{a3^n - a}{3-1}$$

$$728 = \frac{486 \times 3 - a}{2} \quad (\text{from } ①)$$

$$\Rightarrow a = -1456 + 1458$$

$$\Rightarrow \underline{a = 2}$$

Q.5:- L.H.S. $= \sqrt{\dfrac{1 - \sin A}{1 + \sin A}}$

$$= \sqrt{\frac{1 - \sin A}{1 + \sin A} \times \frac{1 - \sin A}{1 - \sin A}}$$

$$= \sqrt{\frac{(1 - \sin A)^2}{1 - \sin^2 A}}$$

$$= \frac{1 - \sin A}{\cos A} \quad (\because 1 - \sin^2\theta = \cos^2\theta)$$

$$= \frac{1}{\cos A} - \frac{\sin A}{\cos A}$$

$$= \sec A - \tan A$$

$$= \underline{\text{R.H.S.}}$$

P.T.O.

Ques. 6:-

$$L.H.S. = \frac{\sin(A-B)}{\cos A \cos B} + \frac{\sin(B-C)}{\cos B \cos C} + \frac{\sin(C-A)}{\cos C \cdot \cos A}$$

$$= \frac{\sin A \cos B - \cos A \sin B}{\cos A \cos B} + \frac{\sin B \cos C + \cos B \sin C}{\cos B \cos C}$$

$$+ \frac{\sin C \cdot \cos A - \cos C \sin A}{\cos C \cdot \cos A}$$

$$= \cancel{\tan A} - \cancel{\tan B} + \cancel{\tan B} - \cancel{\tan C} + \cancel{\tan C} - \cancel{\tan A}$$

$$= 0 \quad \underline{R.H.S.}$$

Q. 7:-

$$\text{area of } \Delta = \frac{1}{2}\left[x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)\right]$$

Given points $(1,3), (-7,6), (5,-1)$

$$\therefore \text{area of } \Delta = \frac{1}{2}\left[1(6+1) - 7(-1-3) + 5(3-6)\right]$$

$$= \frac{1}{2}\left[7 + 28 - 15\right]$$

$$= \frac{1}{2} \times 20$$

$$= 10 \text{ sq. unit}$$

Q. 8.

Let $A = \begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$

first find cofactor

$a_{11} = -9+8 = -1$

$a_{12} = -(6-12) = 6$

$a_{13} = -4+9 = 5$

$a_{21} = -(3-2) = -1$

$a_{22} = 3+3 = 6$

$a_{23} = -(-2-3) = 5$

$a_{31} = 4-3 = 1$

$a_{32} = -(4+2) = -6$

$a_{33} = -3-2 = -5$

P.T.O.

$\therefore$ cofactor matrix of $A = \begin{bmatrix} -1 & 6 & 5 \\ -1 & 6 & 5 \\ 1 & -6 & -5 \end{bmatrix}$

$\therefore$ adj A = Transpose of cofactor matrix

$$= \begin{bmatrix} -1 & -1 & 1 \\ 6 & 6 & -6 \\ 5 & 5 & -5 \end{bmatrix}$$

$$|A| = 1 \times -1 + 1 \times 6 + (-1)5$$

$$= -1 + 6 - 5$$

$$= \underline{\underline{0}}$$

$\therefore A^{-1} = \dfrac{\text{adj } A}{|A|}$

$\because |A| = 0$

$\therefore A^{-1}$ does not exists.

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