Sc-102/Maths-I/1st Sem (N)/2018/J/A

MATHEMATICS-I

(New Course)

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

PART – A

Marks – 25

1. Choose the correct answer : $1\times10=10$

(a) $\frac{1+i}{1-i}$ is equal to

(i) $0+i$ (ii) $0-i$

(iii) $2+i$ (iv) $2-i$

(b) Modulus of $\frac{4}{1+i\sqrt{3}}$ is

(i) 4 (ii) $\frac{1}{2}$

(iii) 2 (iv) $\frac{1}{4}$

(c) The argument of $\sqrt{3}+i$ is

(i) $\frac{\pi}{3}$ (ii) $\frac{\pi}{6}$

(iii) 0 (iv) $\frac{\pi}{2}$

(d) The value of $\omega+\omega^2+\omega^3$ is

(i) 1 (ii) ω

(ii) 0 (iv) ω^2

(e) Number of ways the letters of the word MONDAY may be arranged is

(i) 120 (ii) 720

(iii) 240 (iv) 360

(f) How many fractions are in $\frac{2x^2}{(x-2)(x-4)^2}$?

(i) 2 (ii) 3

(iii) 4 (iv) 1

(g) The logarithmic series is given by

(i) log x (ii) log 2

(iii) log(1−x) (iv) log(1+x)

(h) The sum to 20 terms of the series 1+2+3+4+..... is

(i) 420 (ii) 410

(iii) 240 (iv) 210

(i) Number of terms in $\left(2-x^2\right)^{15}$ is

(i) 16 (ii) 15

(iii) 14 (iv) 30

(j) $\log_3 4 \times \log_4 3$ is equal to

(i) $\log_3 12$ (ii) $\log_4 12$

(iii) log1 (iv) 1

2. Choose the correct statement : $1 \times 5 = 5$

(a) (i) $\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B$

(ii) $\sin(A+B)\sin(A-B) = \cos^2 A - \sin^2 B$

(iii) $\sin(A+B)\sin(A-B) = \sin^2 A - \cos^2 B$

(b) In a ΔABC

(i) $\tan A + \tan B + \tan C = 1$

(ii) $\tan A + \tan B + \tan C = \tan A \tan B \tan C$

(iii) $\tan A + \tan B + \tan C =$
$\tan A \tan B + \tan B \tan C + \tan C \tan A$

(c) (i) $\sec^2 A + \operatorname{cosec}^2 A = \tan A - \cot A$

(ii) $\sec^2 A + \operatorname{cosec}^2 A = \tan A + \cot A$

(iii) $\sec^2 A + \operatorname{cosec}^2 A = \sec^2 A \operatorname{cosec}^2 A$

(d) (i) $\sin 3\theta = 4\sin^3\theta - 3\sin\theta$

(ii) $\sin 3\theta = 3\sin\theta - 4\sin^3\theta$

(iii) $\sin 3\theta = 3\sin^3\theta - 4\sin\theta$

(e) (i) $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$

(ii) $\sin^{-1} x + \operatorname{cosec}^{-1} x = \frac{\pi}{2}$

(iii) $\cos^{-1} x + \sec^{-1} x = \frac{\pi}{2}$

3. Choose the correct answer : $1 \times 5 = 5$

(a) The dimensions of a cuboid are in the ratio 1:2:3, then the ratio of the areas of its base and top is

(i) 1 : 1 (ii) 2 : 3

(iii) 1 : 3 (iv) 1 : 2

(b) The amount of concrete required to build a pillar of cross-section 2 square ft. and height 18 ft is

(i) 36 sq.ft (ii) 72 sq.ft

(iii) 36 cub.ft (iv) 72 cub.ft

(c) The volume of a right circular cylinder of height 12m and base radius 3m is

(i) 339.39 cub.m (ii) 329.29 cub.m

(iii) 339.29 cub.m (iv) 329.39 cub.m

(d) Tetrahedron is a

(i) parallelepiped (ii) pyramid

(iii) cuboid (iv) prism

(e) The curved surface area of a sphere of radius 3cm is

(i) 213.24 sq.cm (ii) 113.24 sq.cm

(iii) 213.14 sq.cm (iv) 113.14 sq.cm

4. Choose the correct statement : 1×5=5

(a) (i) Locus of a point equidistant from a fixed point is a circle.

(ii) Locus of a point equidistant from two fixed points is a circle.

(iii) Locus of a point equidistant from three fixed points is a circle.

(b) (i) The Cartesian co-ordinates of $(4,30^\circ)$ is $\left(2\sqrt{3},2\right)$.

(ii) The polar co-ordinates of $(1,-1)$ is $\left(\sqrt{2},135^\circ\right)$.

(iii) Three points are collinear if area of the triangle formed by the three points is unity.

(c) (i) Equation of a straight line in intercept form is $ax+by=1$.

(ii) Equation of a straight line in perpendicular form is $x\cos\alpha+y\sin\alpha=p$.

(iii) Equation of a straight line in point–point form is $y-y_1=m\left(x-x_1\right)$.

(d) (i) Equation of a straight line parallel to $ax-by+c=0$ is $bx+ay+k=0$.

(ii) Equation of a straight line perpendicular to $ax-by+c=0$ is $bx-ay+k=0$.

(iii) Equation of a straight line perpendicular to $ax-by+c=0$ is $bx+ay+k=0$.

(e) (i) Equation of a straight line bisecting $\angle XOY$ is $ax+by+c=0$

(ii) Equation of a straight line bisecting $\angle XOY$ is $x=y$

(iii) None of the above.

PART – B

Marks – 45

5. Answer any *five* questions : $2\times5=10$

(i) Find the square root of $7-24i$.

(ii) Apply De Moivre's Theorem to find the value of $\dfrac{(\cos 2\theta+i\sin 2\theta)^3}{(\cos 3\theta+i\sin 3\theta)^2}$

(iii) How many ways 9 students may be seated so that two of them are always together ?

(iv) Find n, if ${}^nP_6=30\times{}^nP_4$

(v) Prove that ${}^nC_r+{}^nC_{r-1}={}^{n+1}C_r$

(vi) Find the middle term of $\left(2x+\dfrac{1}{x^2}\right)^{18}$

(vii) Find the logarithm of 125 to the base $\sqrt{5}$.

6. Expand binomially : $(2x+3y)^4$ 3

7. Answer any *two* questions : $4\times2=8$

(i) Resolve into partial fractions : $\dfrac{2x-3}{x^2+6x+8}$

(ii) Find the sum to n-terms of the series : $1^2+2^2+3^2+4^2+\ldots\ldots\ldots+n^2$.

(iii) Solve using Cramer's rule, $x+y+z=1$, $x+2y+z=2$, $x+y+2z=0$.

(iv) Find A×B where $A=\begin{bmatrix}0 & -5 & -2\\ 1 & -1 & 1\end{bmatrix}$; $B=\begin{bmatrix}2 & 1\\ 3 & 0\\ 4 & -1\end{bmatrix}$

8. Prove that (any *four*) : $2\times4=8$

(i) $\sqrt{2}\cos\left(45^\circ+A\right)=\cos A-\sin A$

(ii) $\dfrac{\cos5^\circ+\sin5^\circ}{\cos5^\circ-\sin5^\circ}=\tan50^\circ$

(iii) $\sin\left(-1230^\circ\right)=-\dfrac{1}{2}$

(iv) $\sin 2\theta = \dfrac{2\tan\theta}{1+\tan^2\theta}$

(v) $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\dfrac{x+y}{1-xy}$

(vi) $\sin 780^\circ \sin 480^\circ + \cos 120^\circ \sin 30^\circ = \dfrac{1}{2}$

9. Answer any *two* : $3\times2=6$

(i) Eliminate θ, $x\cos\theta + 2y\sin\theta = 3$, $-x\cos\theta + 2y\sin\theta = 4$

(ii) Solve for θ, $4\cos^2\theta - 4\sin\theta = 1$, $0 \le \theta \le 180$

(iii) Find the value of $\sin 18^\circ$

(iv) Prove that,

$$a\sin(B-C) + b\sin(C-A) + c\sin(A-B) = 0$$

10. Find by Simpson's rule the area of a curvilineal figure whose ordinates measure

18, 22, 26, 24, 20, 26, 30, 34, 28, 24, 14mts respectively and whose base is 146 mts. 3

11. (a) Answer any *two* : $2\times2=4$

(i) Find the equation of a straight line passing through the points $(5, -1)$ and $(2, -2)$.

(ii) Find the equation of a straight line passing through $(1, -2)$ and parallel to $5x+2y+3=0$.

(iii) Find the angle between the lines : $3x+y+15=0$ and $x+2y+11=0$.

(b) Find the distance between the lines :

$5x+2y-6=0$ and $5x+2y+8=0$ 3