Total No. of printed pages = 10

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

MATHEMATICS - I

(Old 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 : $1 \times 10 = 10$

(a) $(1+i)(1+2i)(1+3i)$ is equal to

(i) $-10+i.0$ (ii) $10+i.0$

(iii) $0+i.10$ (iv) $0-i.10$

(b) Modulus of $\frac{1+2i}{1-3i}$ is

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

(iii) $\frac{1}{\sqrt{2}}$ (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

(iii) 0 (iv) ω^2

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

(i) 120 (ii) 720

(iii) 240 (iv) 360

(f) The roots of the equation $ax^2+bx+c=0$ are real if

(i) $b^2-4ac=0$ (ii) $b^2-4ac\geq 0$

(iii) $b^2-4ac>0$ (iv) $b^2-4ac<0$

(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 $\left(x^2-2y^3\right)^8$ is

(i) 9 (ii) 8

(iii) 10 (iv) 16

(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 : $1 \times 10 = 10$

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

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

(f) The value of sec A when $\sin A = \frac{\sqrt{3}}{2}$ is

(i) $\frac{\sqrt{3}}{2}$ (ii) $\frac{2}{\sqrt{3}}$

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

(g) The value of $\sin 70^\circ \cos 20^\circ + \cos 70^\circ \sin 20^\circ$ is

(i) 1 (ii) $\frac{2}{\sqrt{3}}$

(iii) $\frac{\sqrt{3}}{2}$ (iv) $\frac{1}{2}$

(h) The value of $4\cot^2 45^\circ + 3\tan 45^\circ - 2\sin 90^\circ$ is

(i) 3 (ii) 2

(iii) 5 (iv) $\frac{1}{2}$

(i) If $\cos\theta = \cos\alpha$ then,

(i) $\theta = 2n\pi + \alpha,\ n \in I$ (ii) $\theta = n\pi \pm \alpha,\ n \in I$

(iii) $\theta = n\pi + \alpha,\ n \in I$ (iv) $\theta = 2n\pi \pm \alpha,\ n \in I$

(j) The value of $\tan 405^\circ$ is equal to

(i) -1 (ii) 0

(iii) 1 (iv) ∞

3. Find 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 3 square ft. and height 18 ft is

(i) 54 sq.ft (ii) 72 sq.ft

(iii) 54 cub.ft (iv) 162 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

PART – B

Marks – 45

4. Answer any *four* questions : $2\times4=8$

(i) if $x \alpha y$ and $x=30$ when $y=10$, find the value of x when $y=5$

(ii) How many ways 8 students may be seated so that two of them are always together ?

(iii) Find ${}^{8}P_{3}$

(iv) Prove that ${}^{n}C_{r} = {}^{n}C_{n-r}$

(v) Find the third term of $\left(2x+\frac{1}{x^2}\right)^{18}$

(vi) Find the logarithm of 625 to the base 5.

5. Answer any *four* questions : $3\times4=12$

(i) Find the square root of $0+8i$.

(ii) If p and q are the roots of the equation $x^2+7x+12=0$, form an equation whose roots are $(p+q)^2$ and $(p-q)^2$.

(iii) Find the sum to n-terms of the series : $4+44+444+4444+$ ..... .

(iv) Prove that,

$$1+\frac{x^2}{2!}+\frac{x^4}{4!}+\frac{x^6}{6!}+\ldots\ldots=\frac{1}{2}\left[e^x+e^{-x}\right].$$

(v) Solve using Cramer's rule, $5x-y=9$, $3x+y=7$, $x+y+z=4$.

6. Answer any *three* questions : $2\times3=6$

(i) Prove that : $\tan^2 A-\tan^2 B=\frac{\sin^2 A-\sin^2 B}{\cos^2 A\cdot\cos^2 B}$

(ii) Prove that : $\frac{\cos 10^\circ-\sin 10^\circ}{\cos 10^\circ+\sin 10^\circ}=\tan 35^\circ$

(iii) Find the value : $\cos 15^\circ$

(iv) Find the value : $\sec(-1305^\circ)$

(v) Express $1+\sin\theta$ as a perfect square.

7. Answer any *three* questions : $3\times3=9$

(i) Prove that $\cos 20^\circ+\cos 100^\circ+\cos 140^\circ=0$

(ii) Find the value of $\tan 2\theta$ if $\sin\theta=4/5$

(iii) Express $\sec\theta$ and $\tan\theta$ in terms of $\sin\theta$.

(iv) If $\sin(A-B)=\frac{1}{2}$ and $\cos(A+B)=\frac{1}{2}$ then find A and B.

8. The following offsets were taken from a survey line to a hedge : 4

Distance from survey line (m)	0	6	12	18	24	30	36
Offsets (m)	2.0	1.8	3.0	3.4	3.9	1.5	1.2

Find the area between the survey line and the hedge.

9. Answer any *two* questions : 3×2=6

(i) Find the area of a regular octagon whose side measures 3cm.

(ii) The base of a right prism is an equilateral triangle of side 7 inch, find the volume of the prism if its height is 24 inch.

(iii) Find the volume of the largest right circular cone which can be cut out of a cube of edge 3 ft.

(iv) Find the volume of a right pyramid 10ft high having a square base with diagonals measuring 10ft.