Total No. of printed pages = 9

RETEST EXAMINATION – 2022

Semester : 1st

Subject Code : Sc - 102(New)

MATHEMATICS - I

Full Marks – 70

Time – Three hours

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

Instruction :

- *All* questions of PART–A and PART–B are compulsory.

PART – A

Marks – 25

1. Answer the following questions : 1×5=5

(a) The value of $\sqrt{-16}$ is

(i) 4i (ii) – 4i

(iii) 2i (iv) –2i

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(b) The modulus of $5 + 4i$ is

(i) 41 (ii) -41

(iii) $\sqrt{41}$ (iv) $-\sqrt{41}$

(c) The value of sin 750° is

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

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

(d) How many permutations of the letters of the word 'APPLE' are there ?

(i) 120 (ii) 240

(iii) 60 (iv) 30

(e) The general term of the expansion $(a + b)^n$ is

(i) $T_{r+1} = nC_r\ a^r b^r$

(ii) $T_{r+1} = nC_r\ a^{n-r} b^r$

(iii) $T_{r+1} = nC_r\ a^{n-r} b^{n-r}$

(iv) $T_{r+1} = nC_r\ a^r b^{n-r}$.

2. Answer the following questions : 1×5=5

(a) For common logarithm, the base is

(i) 2 (ii) e

(iii) 10 (iv) 1

(b) In the series 7, 10, 13, ... 20th term is

(i) 56 (ii) 55

(iii) 60 (iv) 64

(c) If the order of matrix A is 2×3 and the order of matrix B is 3×2 then the order of the matrix AB is

(i) 2 × 2 (ii) 2 × 3

(iii) 3 × 2 (iv) 3 × 3

(d) Transpose of a row matrix is

(i) Zero matrix (ii) Column matrix

(iii) Diagonal matrix (iv) Row matrix

(e) The value of $\sin 30° \cos 15° + \cos 30° \sin 15°$ is

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

(iii) $\frac{1}{2}$ (iv) 0.

3. Answer the following questions : $1 \times 5 = 5$

(a) If $|A| = 0$ then A is

(i) Zero matrix

(ii) 0

(iii) Singular matrix

(iv) Non-singular matrix

(b) The principal value of $\sin^{-1}\left(-\frac{1}{2}\right)$ is

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

(iii) $\frac{\pi}{3}$ (iv) $-\frac{\pi}{3}$

(c) In any ΔABC, which one is correct ?

(i) $a = bCosA + cCosB$

(ii) $a = bCosB + cCosA$

(iii) $a = bCosC + cCosB$

(iv) $a = aCosB + bCosA$

(d) What is the ratio of their surface areas if the radius of a sphere is doubled

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

(iii) 1:4 (iv) None of these

(e) If $\Delta = \begin{vmatrix} 5 & 3 & 8 \\ 2 & 0 & 1 \\ 1 & 2 & 3 \end{vmatrix}$ then the minor of the element a_{23} is

(i) 7 (ii) -7

(iii) -1 (iv) 5

4. Answer the following questions : $1\times5=5$

(a) If $\cos\theta=\frac{3}{4}$ then the value of $\cos 2\theta$ is _____.

(b) _____ ordinates are used in Simpso'ns $\frac{1}{3}$rd rule.

(c) The total surface area of a cylinder of base radius r and height h is _____.

(d) If $x=\log y$, then y is called the _____ of x.

(e) The middle term in the expansion of $\left(2x+\frac{1}{x}\right)^8$ is _____.

5. Write True or False : $1\times5=5$

(a) The value of $(\sec\theta-\tan\theta)(\sec\theta+\tan\theta)$ is -1.

(b) The slope of the line passing through the points $(3, -2)$ and $(1, 4)$ is -3.

(c) Equation of a line parallel to x-axis is given by $x = a$(const).

(d) The equation of a line which makes intercept 4 and –5 on the x- axis and y-axis is $\frac{x}{4}-\frac{y}{5}=1$

(e) $\sin^2 46 + \sin^2 42 = 1$.

PART – B

Marks – 45

6. Answer the following questions : $2\times5=10$

(a) Find the amplitude of the complex number $1+i\sqrt{3}$.

(b) If $nC_5 = nC_{12}$ find n.

(c) Find the co-efficient of x^4 in the expansion of $\left(2x^2+\frac{1}{x}\right)^{20}$.

(d) Show that $\log_b a \times \log_c b \times \log_a c = 1$

(e) Find the sum of 5 + 9 + 13 + ... + 49.

7. Answer the following questions : $3\times5=15$

(a) Resolve into partial fractions $\frac{9-9x}{2x^2+7x-4}$.

(b) Find the product of $\begin{bmatrix} 2 & 1 \\ 3 & 2 \\ 1 & 1 \end{bmatrix}$ $\begin{bmatrix} 1 & 0 & 1 \\ -1 & 2 & 1 \end{bmatrix}$.

(c) Show that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$.

(d) Prove that $7\log\frac{10}{9} - 2\log\frac{25}{24} + 3\log\frac{81}{80} = \log 2$.

(e) If A + B = 45°, then show that (1 + tan A) (1 + tan B) = 2.

8. Answer the following questions : $3\times5=15$

(a) In a triangle ABC, prove that

$$\frac{a+b}{c} = \frac{\cos\left(\frac{A-B}{2}\right)}{\sin\frac{C}{2}}.$$

(b) Calculate the total area of a field with a base of 60m and ordinates 2, 4, 6, 7, 10, 12, 8, 5, 10 respectively.

(c) A rectangular pyramid has a base area of 56 cm^2 and a volume of 224 cm^3. What is the height of the pyramid ?

(d) Find the equation of a straight line, which passes through the point (1, 2) and which is parallel to the straight line $2x+3y+6=0$.

(e) Show that the points (5, 2), (7, 9) and (9, 16) are collinear.

9. Solve the following equations by Cramer's rule 5

$3x+3y-4z=2$, $5x-y=4$, $8x+2y-3z=7$.