2020

MATHEMATICS GENERAL

Paper: 2

Internal Assessment

SET-2

Full Marks: 50

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.
Notations and symbols have their usual meaning.

(Module-III)

Group-A

(Marks 12)

1. Answer any two questions
   (a) Show that the set $W = \{(x, y, z) \ / \ x + y + z = 0\}$ forms a subspace of $\mathbb{R}^3$. **6**
   (b) Check whether the quadratic form $2x^2 + 2y^2 + 2z^2 + 2xy + 2xz$ is positive definite or not. **6**
   (c) Prove that the set {1,α,α^2} where α^3=1, form a group with respect to multiplication. **6**

Group-B

(Marks 13)

2. Answer any two questions
   (a) Find the equation of the tangent plane of the sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wx + d = 0$ at the point $(x_1, , y_1, z_1)$

   (b) A point p moves on a fixed plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$. The plane through p perpendicular to op meets the axes A, B,C. The plane through A,B,C parallel to the YOZ, ZOX and XOY intersect at Q. Show that the locus of Q is $\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = \frac{1}{ax} + \frac{1}{by} + \frac{1}{cz}$.

   (c) Show that the equation of the plane containing the straight line $\frac{y}{b} + \frac{z}{c} = 1, x = 0,$ and parallel to the straight line $\frac{x}{a} - \frac{z}{c} = 1, y = 0,$ is
   $$\frac{x}{a} + \frac{y}{b} - \frac{z}{c} - 1 = 0$$

(Module-IV)

Group-A

(Marks 12)

3. Answer any two questions

   (a) Expand $sinx$ in an infinite Maclaurin's series starting the range of validity of the expansion. **6**

   (b) Evaluate $\lim_{x\to 0}\left(\frac{tanx}{x}\right)^{1/x}$ **6**

   (c) Find the extreme value of $f(x,y) = 2x^2 - xy + 2y^2 - 20x$ **6**

Group-B

(Marks 8)

4. Answer any one of the following

   (a) Find the area bounded by the curve $y = x^3$ and $y = 2x$. **8**

   (b) Define Gamma function and prove that

   $$\int_0^\infty e^{-x^2} x^m dx = \frac{1}{2}\Gamma\left(\frac{m+1}{2}\right), m > 1$$ **8**

Group-B

(Marks 5)

5. Answer any one of the following

   (a) Solve: $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 4y = 3sin2x$ **5**

   (b) Solve: $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = 2x^3$ **5**