

DEROZIO MEMORIAL COLLEGE

B.Sc. 2nd Semester Honours

Internal Examination 2020

MTMACOR04T – MATHEMATICS (CC04)

Differential Equation and Vector Calculus

Time Allotted: 1 Hours

Full Marks: 10

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

All symbols are of usual significance.

Answer any five questions

2 X 5 = 10

1. Show that the substitution $z = \sin x$ transforms the equation

$$\frac{d^2y}{dx^2} + \tan x \frac{dy}{dx} + y \cos^2 x = 0 \text{ into } \frac{d^2y}{dz^2} + y = 0$$

2. Solve the differential equation $\frac{dy}{dx} = \sin(x + y)$

3. Solve the differential equation $(x + y + 1)dx = (2x + 2y + 1)dy$

4. Solve the differential equation $(1 + x) \frac{dy}{dx} - xy = 1 - x$

By using method of variation of parameters.

5. Solve the differential equation $(D^2 - 2D + 5)y = 12 + 25x^2$

By using method of undetermined coefficients.

6. If $\vec{A} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{B} = 3\hat{i} + 4\hat{j} + 5\hat{k}$, find the angle between \vec{A} and \vec{B}

7. If $\vec{A} + \vec{B} = 5\hat{i} + 3\hat{j} + 2\hat{k}$ and $\vec{A} \times \vec{B} = 7\hat{i} + 11\hat{j} + \hat{k}$, find \vec{A} and \vec{B} .

8. If $\vec{A} + \vec{B} + \vec{C} = \vec{0}$, prove that $\vec{A} \times \vec{B} = \vec{B} \times \vec{C} = \vec{C} \times \vec{A}$.

9. Determine λ and μ such that the points $(-1, 3, 2)$, $(-4, 2, -2)$ and $(5, \lambda, \mu)$ are collinear.