

**SESSIONAL EXAMINATION**  
**DTC**  
**THIRD SEMESTER [B.TECH] OCT'20**

**Paper Code: BSC-MATH-203G**

**Subject: Mathematics-III**

**Time: One Hour Thirty Minutes**

**Max. Marks: 30**

**Note: Attempt any *three* questions including Q.no. 1 which is compulsory. All questions carry equal marks.**

Q.1. Attempt any two questions:

(5 X 2 = 10)

a. Let  $f: \mathbb{R}^2 \rightarrow \mathbb{R}$  be defined by  $f(x, y) = \begin{cases} \frac{x^2 y}{x^4 + y^2}, & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0) \end{cases}$

Prove that  $\lim_{(x, y) \rightarrow (0, 0)} f(x, y)$  does not exist.

b. If  $u = x^2 + y^2$ ,  $x = at^2$  and  $y = 2at$ . Find  $\frac{du}{dt}$

c. Evaluate  $\int_0^3 \int_1^2 xy(1 + x + y) dy dx$

d. Explain Euler's theorem for Homogenous functions.

e. Evaluate  $\int_0^1 \int_0^1 \int_0^1 x^2 y^2 z^2 dx dy dz$

Q.2. (a) If  $u = \tan^{-1} \frac{x^3 + y^3}{x - y}$ , Prove that  $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = \sin 4u - \sin 2u$  (10)

OR

(b) In a plane triangle ABC, find the maximum value of  $\cos A \cos B \cos C$  (10)

Q.3. (a) Evaluate by changing the order of integration of  $\int_0^{4a} \int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dy dx$  (10)

OR

(b) Determine the area of region bounded by the lines  $x = -2$ ,  $x = 2$  and the circle  $x^2 + y^2 = 9$  (10)

\*\*\*\*\*