

SESSIONAL EXAMINATION
CBS
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 $f(x,y) = \begin{cases} \frac{xy}{x^2+y^2}, & (x,y) \neq (0,0) \\ 0, & (x,y) = (0,0) \end{cases}$

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

b. If $u = \sin^{-1}(x-y)$, $x=3t$ and $y=4t^3$. Find $\frac{du}{dt}$

c. Evaluate $\int_0^3 \int_0^1 x^2 + 3y^2 dy dx$

d. Explain Euler's theorem for Homogenous functions.

e. Evaluate $\int_0^1 \int_0^1 \int_0^1 e^{x+y+z} dx dy dz$

Q.2. (a) If $u = \sin^{-1} \frac{x+y}{\sqrt{x}+\sqrt{y}}$, Prove that $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = \frac{-\sin u \cos 2u}{4 \cos^3 u}$ (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 $\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{x}{\sqrt{x^2+y^2}} dy dx$ (10)

OR

(b) Determine the area of region bounded by the curve $xy=2$, $4y=x^2$, $y=4$ (10)
