2021
B.A./B.Sc.
First Semester
CORE – 2
STATISTICS
Course Code: STC 1.21
(Calculus)

PART–B
Total Mark: 30

Answer the following questions.

1. (a) If $u = e^{xyz}$ then prove that $\frac{\partial^3 u}{\partial x\, \partial y\, \partial z} = \left(1 + 3xyz + x^2y^2z^2\right) e^{xyz}$ 3

   (b) Find the value of $\lim_{x\to 0}\left(\frac{1}{x} - \frac{1}{\sin x}\right)$ using L' Hospital rule. 3

2. (a) Evaluate any one of the following 2

   (i) $\int_0^1 x^3 \left(1 - x^2\right)^{\frac{5}{2}} dx$

   (ii) $\int_0^{\infty} \frac{x^8\left(1 - x^6\right)}{\left(1 + x\right)^{24}} dx$

   (b) Change the order of integration and evaluate $\int_0^2 \int_{x^2}^{2x} xy\, dydx$ 4

3. Find the maximum and minimum value of $f\left(x, y, z\right) = x - 2y + 5z$ on the sphere

   $x^2 + y^2 + z^2 = 30$ 6

4. (a) Find the differential equation of $\left(x - h\right)^2 + \left(y - k\right)^2 = c^2$ 2

   (b) Solve the following differential equations: 2+2=4

   (i) $\sin^{-1}\left(\frac{dy}{dx}\right) = x + y$

   (ii) $\frac{dy}{dx} = \frac{x - y + 3}{2x - 2y + 5}$

5. Solve the following equations:

   (i) $yzp + zxq = xy$ by Lagrange's method 2

   (ii) $x^2 y\, dx - \left(x^3 + y^3\right) dy = 0$ 4