Roll No.

3034

B. Tech 3rd Semester (CSE) Examination – December, 2019

MATHEMATICS - III

(Multivariable Calculus and Differential Equations)

Paper: BSC-Math-203-G

Time: Three Hours]

[Maximum Marks: 75]

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note: Attempt *five* questions in total, first being *compulsory* and select *one* from each unit.

1. (a) Investigate the continuity of the function

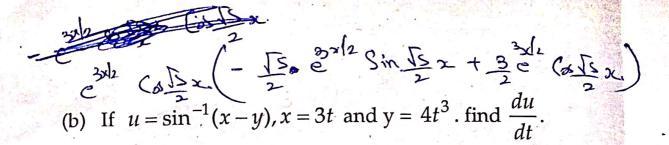
$$f(x,y) = xy/(x^2 + y^2), (x,y) \neq (0,0)$$

$$=0, (x,y)=(0,0)$$

at the origin.

(DQ-1) [D2-50+6+ 348]+16 [DQ-1) [D2-50+14] +16 P. T. O.

3034-2,100 -(P-4)(Q-9)(19)



(c) Evaluate $\iint r^2 \sin \theta \, dr \, d\theta$ where, R is the semicircle $r = 2a \cos \theta$ above the initial line

(d) Solve
$$\cos^2 x \frac{dy}{dx} + y = \tan x$$

(e) Solve
$$\frac{d^4y}{dx^4} + 8\frac{d^2y}{dx^2} + 16y = 0$$

Using method of variation of parameter solve,

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x / x$$

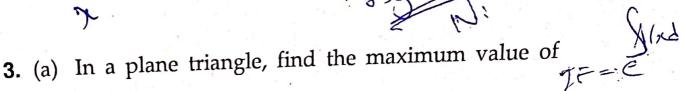
$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x / x.$$
UNIT – I

- **2.** (a) Let $r^2 = x^2 + y^2 + z^2$ and $v = r^m$, prove that $V_{xx} + V_{yy} + V_{zz} = m(m+1) r^{m-2}$
 - (b) If $u = \sin^{-1} \frac{x+y}{\sqrt{x}+\sqrt{u}}$, find the value

$$x^{2} \frac{\partial^{2} u}{\partial x^{2}} + 2xy \frac{\partial^{2} u}{\partial x \partial y} + y^{2} \frac{\partial^{2} u}{\partial y^{2}}$$

15





cos A cos B cos C.

(b) Find the points on the surface
$$z^2 = x$$

(b) Find the points on the surface
$$z^2 = x_1$$
 nearest to the origin.

4. (a) By changing the order of integration, evaluate the following double integral
$$\int_{0}^{1} \int_{x}^{\sqrt{2-x^2}} \frac{x \, dy \, dx}{\sqrt{x^2 + y^2}}$$

(b) Evaluate
$$\iint_D xy \sqrt{1-x-y} \ dx \ dy$$
 where D is the region bounded by $x=0$, $y=0$, and $x+y=1$ using the transformation $x+y=u$, $y=uv$ 15

5. (a) Find the area between the parabolas
$$y^2 = 4ax$$
 and $x^2 = 4ay$.

(b) Evaluate: (c) (c)
$$\int_{-c^{2}}^{e} \int_{-a}^{b} \int_{-a}^{a} (x^{2} + y^{2} + z^{2}) dx dy dz$$
 (c) $\int_{-c^{2}}^{e} \int_{-a}^{b} \int_{-a}^{a} (x^{2} + y^{2} + z^{2}) dx dy dz$

UNIT - III

6. (a) Solve
$$\sec^2 y \frac{dy}{dx} + x \tan y = x^3$$

(b) Solve $(x^4 e^x - 2mxy^2) dx + 2mx^2 y dy = 0$

15

$$3034-2,100-(P-4)(Q-9)(19)$$
 (3) $4\frac{3}{4}$ P. T. O. Cs²2.
 $1-(+19+10+16)$ $16-48+76-28+16$

- **7.** (a) If the temp. of air is $30^{\circ}C$ and the substance cools trom 100°C to 70°C in 15 minutes. Find when the temperature will be 40°C.
 - (b) Find the orthogonal trisection of the family of curves $s^2 = a^2 \cos 2\theta$. 15

UNIT - IV

8. (a) Solve
$$\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = e^{2x} - \cos^2 x$$
.

(b) Solve
$$(2x+3)^2 \frac{d^2y}{dx^2} - (2x+3) \frac{dy}{dx} - 12y = 6x$$
 15

- (a) Solve the following simultaneous equations $\frac{dx}{dt} + 2y = e^t$, $\frac{dy}{dt} - 2x = e^{-t}$.
 - (b) An alternative E. M. F E sinpt is applied to a circuit at t = 0. Given the equation for the current ias $L \frac{d^2i}{dt^2} + R \frac{di}{dt} + \frac{i}{c} = pE \text{ cospt}$, find the current i15 when: 36 - 16 x12

(i)
$$CR^2 > 4L$$

(ii)
$$CR^2 < 4L$$

(ii)
$$CR^2 < 4L$$

$$S_{1n}^2 \times + cs^2 \times = 1$$

$$S_{2n}^2 \times + cs^2 \times = -1 = cs^2 \times .$$

$$S_{2n}^2 \times + cs^2 \times = -1 = cs^2 \times .$$

$$3C = \frac{27}{2}$$

$$3C = \frac{27}{3}$$

$$3C = \frac{27}{3$$