

Roll No.

Total No. of Pages :02

Total No. of Questions : 07

B.Sc. (CS) (Sem.-2)

**PARTIAL DIFFERENTIATION & DIFFERENTIAL EQUATIONS**

Subject Code :BCS-201

M.Code :71506

Date of Examination : 04-07-22

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTIONS TO CANDIDATES :**

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains SIX questions carrying TEN marks each and students have to attempt any FOUR questions.

**SECTION-A**

**1. Answer the following :**

a) Evaluate  $f_x(0, 0), f_y(0, 0)$ , where

$$f(x, y) = \begin{cases} \sin\left(\frac{xy}{x^2 + y^2}\right), & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0) \end{cases}$$

b) Discuss the continuity of  $f(x, y)$  at  $(0, 0)$ , where

$$f(x, y) = \begin{cases} \frac{2xy^2}{x^3 + y^3}, & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0) \end{cases}$$

c) Solve  $\frac{d^3y}{dx^3} + y = 0$ .

d) Write down the sufficient condition for differentiability of function of two variables.

e) Verify Euler's Theorem for  $z = ax^2 + 2hxy + by^2$ .

f) Solve the differential equation  $p = \sin(y - xp)$ . Also find its singular solution.

- g) Find the limit  $\lim_{(x,y) \rightarrow (0,0)} \frac{2x^2y}{x^4 + y^2}$ .
- h) Solve the differential equation  $(D^3 - 3D^2 + 3D - 1)y = 0$
- i) What is mean by exact differential equation? Explain.
- j) Solve  $(D^4 - D^2)y = 2$ .

### SECTION -B

- Define homogenous functions. State and prove Euler's Theorem for Homogenous functions.
- Prove that  $\lim_{(x,y) \rightarrow (a,b)} f(x,y)$ , if it exists finitely, is unique.
- Show that  $f(x, y) = \sin x + \cos y$  is differentiable at every point of  $\mathbf{R}^2$ .
- Solve  $\frac{d^2y}{dx^2} + y = \tan x$  by the method of variation of parameters.
- Solve in series  $y'' - 4xy' + (4x^2 - 2)y = 0$ .
- Solve the series the Legendre's equation of first order :

$$(1-x^2) \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} + 2y = 0$$

**NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.**