SANJEEV AGRAWAL GLOBAL EDUCATIONAL UNIVERSITY, BHOPAL

MID SEMESTER TEST – II

Autumn 2024-25 (January - 2025)

Name of Program - PhD

Course Name – DSE - Mathematics

Course Code - MA22P104

Max. Duration: 1.5 hrs **Max. Marks: 30**

SECTION - A

1. Objective Type Questions (**ALL QUESTIONS ARE COMPULSORY**) **(5X1 = 05)**

a) Let $z = ax + by$, then the corresponding partial differential equation is

i) $z = x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y}$ ii) $z = x\frac{\partial z}{\partial x} - y\frac{\partial z}{\partial y}$

iii) $z = a\frac{\partial z}{\partial x} + b\frac{\partial z}{\partial y}$ iv) $z = a\frac{\partial z}{\partial x} - b\frac{\partial z}{\partial y}$

b) Let $z = f(x, y)$ then derivative of z with respect to x denoted by

i) $\frac{\partial z}{\partial x}$ ii) $\frac{\partial x}{\partial z}$

iii) $\frac{dz}{dx}$ iv) $\frac{\partial z}{\partial y}$

c) Equation $\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$, represent

i)Heat equation ii)Wave equation

iii)Partial differential equation of order 2 iv)Both (i) and (iii)

d) Simpson's 3/8th rule fit for the polynomial of degree

i. 1 ii. 2

iii. 3 iv. None of these

e) In Gauss elimination method, transforming coefficient matrix to the

i. Upper triangular matrix ii. Lower triangular matrix

iii. Diagonal matrix iv. None of these

SECTION – B

2. Short Answer Type Questions (Attempt **any THREE**) **(3X5 =15)**

a) Construct a partial-differential-equation from the equation $z = f(x+y) + g(x-y)$.

b) Calculate the complete integral of nonlinear partial differential equation $p^2 + q^2 = x + y$

c) Solve partial differential equation $x^2zp + y^2zq = x^2$

d) Solve equations $x + 4y - z = -5;\ x + y - 6z = -12;\ 3x - y - z = 4$ by using Gauss elimination method.

e) Evaluate $\int_0^1 \frac{dx}{1+x}$ using Simpson's 3/8th rule.

SECTION – C

(1X10 =10)

3. Long Answer Type Questions (Attempt **any ONE**)

a) Solve the heat equation $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$, $t > 0$, by the method of separation of variable.

b) Apply Runge-Kutta fourth order method, to find an approximate value of y when $x = 0.2$, given that $\frac{dy}{dx} = x + y$, $y(0) = 1$