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B.Sc.- M.Sc. (Forensic Science) (Semester – 2nd)
DIFFERENTIAL EQUATIONS-I
Subject Code: BSNMS1205
Paper ID: [23480118]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a) Define Exact Differential Equation.
b) Check the weather the differential Equation $\left(x^2 - y^2\right)dx = 2xy\,dy$ is exact or not.
c) Solve $p = Sin(y - px)$.
d) Define linear homogenous D. E with constant coefficients.
e) Find C. F of $\left(D^3 + 1\right)y = 0$.
f) Define Wrens Kian
g) Mention the Difference between 2nd order homogenous and non-Homogenous diff. = n.
h) Solve $\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{z}$.
i) Write the general form of 2nd order Elliptic equation.
j) Write the general form of 2nd order hyperbolic p.d.e.

Section – B **(5 marks each)**

Q2. Solve $(1 + xy)y\,dx + (1 - xy)x\,dy = 0$.

Q3. Solve $p(p + y) = x(x + y)$

Q4. $\left(D^3 + 2D^2 + D\right)y = e^{-x} + sin2x$.

Q5. Solve $\frac{dx}{dt} = 5x + y$, $\frac{dy}{dt} = y - 4x$.

Q6. Write the procedure of solving differential equation by undetermined coefficients.

Section – C **(10 marks each)**

Q7. Use method of variation of parameters to solve $(1 - x)y_2 + xy_1 - y = (1 - x)^2$

Q8. (a) Solve $xy_2 - (2x - 1)_{y_1} + (x - 1)y = 0$

(b) Classify the following partial differential equation

$$xy\frac{\partial^2 z}{\partial x^2} - \left(x^2 - y^2\right)\frac{\partial^2 z}{\partial x \partial y} - xy\frac{\partial^2 z}{\partial y^2} + \frac{\partial z}{\partial x}y - \frac{\partial z}{\partial y}x = 2(x^2 - y^2)$$

Q9. (a) Classify the following P.D.E

$$(x - y)(xr - xs - ys + yt) = (x + y)(p - q)$$

(b) Classify $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{\partial^2 u}{\partial z^2}$.