(i) Printed Pages: 3 Roll No. .....

(ii) Questions : 8 Sub. Code : 0 2 4 2

Exam. Code : 0 0 0 3

B.A./B.Sc. (General) 3rd Semester

(1129)

MATHEMATICS

Paper : II (Differential Equations-I)

Time Allowed : Three Hours] **[Maximum Marks : 30**

Note :— Attempt **FIVE** questions, selecting at least **TWO** questions from each Unit.

UNIT—I

1. (a) If $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ is a function of x only, say f(x), then show that $e^{\int f(x)dx}$ is an integrating factor of $Mdx + Ndy = 0$.

   (b) Given that the differential equation $(2x^2y^2 + y)dx - (x^3y - 3x)dy = 0$ has an integrating factor of the form x^hy^k, find its general solution. 3,3

2. (a) Solve :

   $$xyp^2 - (x^2 + y^2 - 1)p + xy = 0.$$

   (b) Solve the differential equation :

   $$p = \tan\left(x - \frac{p}{1+p^2}\right).$$ 3,3

3. (a) Obtain the primitive and singular solution, if it exists, of the equation, $xp^2 - 2yp + 4x = 0$.

(b) Find the orthogonal trajectories of the family of coaxial circles $x^2 + y^2 + 2gx + c = 0$, where g is the parameter. 3,3

4. (a) Solve the differential equation :

$$\frac{d^2y}{dx^2} + a^2y = \sec ax .$$

(b) Solve :

$$\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = e^{2x} + x^2 + x . \quad 3,3$$

UNIT—II

5. (a) Solve the differential equation :

$$x^2\frac{d^3y}{dx^3} + 3x\frac{d^2y}{dx^2} + \frac{dy}{dx} + \frac{y}{x} = \log x .$$

(b) Solve :

$$(x+3)^2\frac{d^2y}{dx^2} - 4(x+3)\frac{dy}{dx} + 6y = x . \quad 3,3$$

6. (a) Solve by the method of variation of parameters :

$(D^2 + 3D + 2)y = \sin e^x$.

(b) Solve $\frac{d^2y}{dx^2} - 2\tan x\frac{dy}{dx} + 5y = e^x \sec x$ by the method of removal of first derivative. 3,3

7. (a) Solve :

$$x^2\frac{d^2y}{dx^2}-(x^2+2x)\frac{dy}{dx}+(x+2)y=x^3\,e^x$$

by changing the dependent variable.

(b) Transform the differential equation :

$$(\cos x)y'' + (\sin x)y' - 2y\cos^3 x = 2\cos^5 x$$

into the one having z as independent variable where $z = \sin x$ and solve it. 3,3

8. (a) Solve :

$$\frac{dx}{dt}+\frac{dy}{dt}=3x-6y$$

$$\frac{dx}{dt}-\frac{dy}{dt}+x+4y=0.$$

(b) Solve : $D^2x - 3Dy + 4x = 0$ and $3Dx + D^2y + 4y = 0$

where $D=\frac{d}{dt}$. 3,3