

Roll No.

21252

B. Sc. (Hons.) Maths. 2nd Semester
Examination – May, 2019

ORDINARY DIFFERENTIAL EQUATIONS

Paper : BHM-122

Time : Three hours] [Maximum Marks : 60

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 all, selecting one question from each Unit. Question No. 9 (Unit – V) is compulsory. All questions carry equal marks.

UNIT – I

1. (a) Solve :

$$(2y \sin x + 3y^4 \sin x \cos x) dx - (4y^3 \cos^2 x + \cos x) dy = 0$$

(b) Solve :

$$p^2 + 2py \cot x = y^2$$

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- 2. (a) Reduce the equation $xp^2 - 2py + x + 2y = 0$ to the Clairaut's form by putting $y - x = v$ and $x^2 = u$. Hence obtain and interpret the primitive and singular solution of the equation.
- (b) Find the orthogonal trajectories of the curves :

$$r^n \sin n \theta = a^n$$

UNIT – II

3. (a) Solve :

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

(b) Solve :

$$\frac{d^2y}{dx^2} - 4 \frac{dy}{dx} + 4y = 3x^2 e^{2x} \sin 2x$$

4. (a) Solve :

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

(b) Solve :

$$(3x + 2)^2 \frac{d^2y}{dx^2} + 5(3x + 2) \frac{dy}{dx} - 3y = x^2 + x + 1$$

(2)

UNIT - III

5. (a) Solve :

$$(1-x^2) \frac{d^2y}{dx^2} + x \frac{dy}{dx} - y = x(1-x^2)^{3/2}$$

(b) Solve :

$$\frac{d^2y}{dx^2} - 4x \frac{dy}{dx} + (4x^2 - 3)y = e^{x^2}$$

6. (a) Solve :

$$\frac{d^2y}{dx^2} - (1+4e^x) \frac{dy}{dx} + 3e^{2x}y = e^2(x+e^x)$$

(b) Solve :

$$(1-x)y'' + xy' - y = 2(x-1)^2 e^{-x}$$

with given that x and e^x are solutions of homogeneous equation.

UNIT - IV

7. (a) Solve :

$$2 \frac{d^2y}{dx^2} - \frac{dz}{dx} - 4y = 2x$$

$$2 \frac{dy}{dx} + 4 \frac{dz}{dx} - 3z = 0$$

(b) Solve the simultaneous equations :

(i) $\frac{dx}{\cos(x+y)} = \frac{dy}{\sin(x+y)} = \frac{dz}{z + \frac{1}{z}}$

(ii) $\frac{x dx}{z^2 - 2yz - y^2} = \frac{dy}{y+z} = \frac{dz}{y-z}$

8. (a) Solve :

$$2yzdx + zxdy - xy(1+z) dz = 0$$

(b) Solve :

$$z(z-y) dx + (z+x) z dy + x(x+y) dz = 0.$$

UNIT - V

9. (a) Solve :

$$\frac{2x}{y^3} dx + \left(\frac{y^2 - 3x^2}{y^4} \right) dy = 0$$

(b) Solve :

$$p^2 - 7p + 12 = 0$$

(c) Solve :

$$\frac{d^4y}{dx^4} + 4y = 0$$

(d) In what condition $y = e^{mx}$ is a solution of

$$\frac{d^2y}{dx^2} + p \frac{dy}{dx} + Qy = 0?$$

(c) Solve :

$$\frac{d^2y}{dx^2} + y = \sin(2x+3)$$

(f) Under what condition the differential equation $Pdx + Qdy + Rdz = 0$ is said to be exact.