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Paper Code: BPCM-203

B

(SVSU:2024-25/S)

Enrollment No.

B.Sc. (PCM)

I YEAR/ISEM EXAMINATION

Subject Name:- Differential Equation

Code-BPCM-203

[Time : 3:00 Hours]

[Max. Marks : 100]

I Long Question : Answer Any Three

[15×3=45]

1. Solve: $pq = 1$, using Charpit's method..
2. Find a complete integral of: $px + qy = pq$
3. Show that: $xJ_n'(x) = -nJ_n(x) + xJ_{n-1}(x)$.
4. Solve: $(D^4 - 1)y = e^x \cos x$.
5. Solve: $(D^4 - 4)y = \cos x$.

II. Short Question: Answer any Five

[5×5=25]

1. Prove that: $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \cdot \cos x$.
2. Show that: $xJ_n'(x) = -nJ_n(x) + xJ_{n-1}(x)$.
3. Solve the simultaneous differential equation:
 $\frac{dx}{dt} + 5x + y = e^t$, $\frac{dy}{dt} - x + 3y = e^{3t}$.
4. Solve: $(D^2 + 1)y = x^2 \sin 2x$.
5. Solve: $x^3 = a + bp$.
6. Solve: $x dy - y dx = 0$
7. Solve: $\frac{dy}{dx} 2y \tan x = y^2 \tan^2 x$.
8. Find complete integral of: $p^2 - q^2 = \delta$.
9. Solve: $(D^3 + 4D + 4)y = e^{2x} - e^{-2x}$.
10. Find : $\frac{d}{dx}(x^n J_n)$

III. Objectives Question: Answer All Question

[15×2=30]

1. The differential equation: $y \frac{dy}{dx} = 2 - x$ ($x \neq a$, $a \in \mathbb{R}$) represents
 - (a) a family of circles with centre on y-axis,
 - (b) a family of circles with centre at origin,
 - (c) a family of circles with given radius,
 - (d) a family of circles with centre on x-axis.

2. While solving the ordinary differential equation using unilateral laplace transform, we consider the initial conditions of the system.

- (a) True, (b) False. (c) both (a)& (b) (d) none of these.

3. Integration factor of differential equation $\frac{dx}{dy} + Py = Q$, where P and Q are functions of y is:

- (a) $e^{\int P dx}$, (b) $e^{\int P dy}$, (c) $e^{-\int P dx}$, (d) none of these.

4. The degree of the differential equation: $(\frac{d^2y}{dx^2})^2 + (\frac{dy}{dx})^3 = x \sin \frac{dy}{dx}$ is:

- (a) 1, (b) 2, (c) 3, (d) not define.

5. The order of differential equation $[1 + (\frac{dy}{dx})^2] = \frac{d^2y}{dx^2}$ is:

- (a) 4, (b) 2, (c) 3/4, (d) not define.

6. Solution of differential equation $xdy - ydx = 0$ represents

- (a) a rectangular hyperbola, (b) parabola whose vertex is at origin,
(c) straight line passing through origin, (d) a circle whose centre is at origin.

7. The degree of the differential equation: $\frac{dy}{dx} + 2y^2 = 5$

- (a) 1, (b) 3, (c) 2, (d) 2.2.

8. The equation $Pp + Qq = R$ is known as

- (a) Charpit's equation, (b) Lagrange's, (c) Bernoulli's, (d) Clairaut's.

9. Lagrange's auxiliary equations of $Pp + Qq = R$ are given by

- (a) $\frac{dx}{R} = \frac{dy}{Q} = \frac{dz}{P}$ (b) $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ (c) $\frac{dx}{Q} = \frac{dy}{R} = \frac{dz}{P}$ (d) none of these.

10. The differential equation $z = px + qy$ is

- (a) non-linear, (b) Linear, (c) Quasi linear, (d) none of these.

11. The value of $P_n(-1)$ is:

- (a) 1, (b) 0, (c) -1, (d) $(-1)^n$.

12. The value of $P_0(x)$ is

- (a) 1, (b) 0, (c) -1, (d) x.

13. Family $y = Ax + A^3$ of curves is represented by the differential equation of degree

- (a) 1, (b) 2, (c) 4, (d) 5.

14. The value of $P_0(0)$ is

- (a) 1, (b) 0, (c) -1, (d) x.

15. The value of $\int x dx = 0$ is

- (a) 1, (b) 0, (c) -1, (d) $x^2 + c = 0$