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SUBJECT CODE NO: - BB-2420
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. (CBCGS) (Pattern 2022) S.Y SEM III
Examination November / December 2024
Mathematics-V Differential Equations

[Time: 1:30 Hours]

[Max. Marks: 40]

Please check whether you have got the right question paper.

N.B

- 1) Attempt all questions.
- 2) Figures to the right indicates full marks.

Q.1 Choose the correct alternative.

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- Integrating factor of $\cos^2 x \frac{dy}{dx} + y = \tan x$ is _____
a) $e^{\sin x}$
b) $e^{\cos x}$
c) $e^{\cot x}$
d) $e^{\tan x}$
- _____ is the Clairaut's equation.
a) $y = px + f(p)$
b) $x = f(p)$
c) $y = f(p)$
d) $y = p^2x + f(p)$
- The roots of auxiliary equation of $\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 4y = 0$ are _____
a) $m_1 = -2, m_2 = 2, m_3 = 1$
b) $m_1 = -2, m_2 = -2, m_3 = 1$
c) $m_1 = 2, m_2 = 2, m_3 = 1$
d) $m_1 = 2, m_2 = 2, m_3 = -1$
- The complementary function of $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = e^{4x}$ is _____
a) $y = c_1e^{-3x} + c_2e^{2x}$
b) $y = c_1e^{3x} + c_2e^{2x}$
c) $y = c_1e^{3x} + c_2e^{-2x}$
d) $y = c_1e^{-3x} + c_2e^{-2x}$
- If $z = \log x$ and $D = \frac{d}{dz}$ them $\frac{x^3 d^3y}{dx^3} =$ _____
a) $D(D-1)y$
b) D^2y
c) $D(D-1)(D-2)y$
d) Dy

Q.2 (A) Attempt any one:

8

- a) Explain the method of solving the differential equation $\frac{dy}{dx} + py = Qy^n$ where P and Q are functions of x
- b) Explain the method of solving the differential equations which are

- (i) Solvable for x
- (ii) Solvable for y.

(B) Attempt any one:

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- a) Solve $(x^2y - 2xy^2)dx - (x^3 - 3x^2y)dy = 0$.
- b) Solve $y = (1 + p)x + p^2$, where $p = \frac{dy}{dx}$.

Q.3 (A) Attempt any one :

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- a) With usual notations, prove that $\frac{1}{f(D)}(xV) = \left\{ x - \frac{1}{f(D)}f^1(D) \right\} \frac{1}{f(D)}V$, where V is any function of x,
- b) Explain the method of finding complementary function of $\frac{x^n d^n y}{dx^n} + p_1 x^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \dots + p_n y = X$, where $p_1, p_2, \dots, p_n$ are constants and X is a function of x.

(B) Attempt any one:

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- a) Solve $\frac{d^3 y}{dx^3} + \frac{d^2 y}{dx^2} - \frac{dy}{dx} - y = \cos 2x$.
- b) Solve $(5 + 2x)^2 \frac{d^2 y}{dx^2} - 6(5 + 2x) \frac{dy}{dx} + 8y = 0$.