SUBJECT CODE NO:- B-2040
FACULTY OF SCIENCE & TECHNOLOGY
B.Sc. F. Y. (Sem-I)
Examination November/December- 2022
Mathematics MAT - 102
(Differential Equations)

[Time: 1:30 Hours] **[Max. Marks:50]**

"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 A) Attempt any one. 08

a) Explain the method of Solving differential equation $\frac{dy}{dx} + Py = Q$, where P, Q are functions of x or constants.

b) Explain the method of solving differential equation

$$\frac{d^n y}{dx^n} + P_1 \frac{d^{n-1} y}{dx^{n-1}} + P_2 \frac{d^{n-2} y}{dx^{n-2}} + \cdots + P_n y = X,$$

Where $P_1, P_2, \ldots, P_n$ are constants and X is a function of x.

B) Attempt any one. 07

c) Solve the simultaneous equations

$$\frac{dx}{dt} - 7x + y = 0 \; ; \frac{dy}{dt} - 2x - 5y = 0$$

d) Solve $\frac{d^2 y}{dx^2} + 2 \frac{dy}{dx} + y = 2e^{2x}$

Q.2 A) Attempt any one. 08

a) Explain the method of solving the differential equation

$$x^n \frac{d^n y}{dx^n} + P_1 x^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \cdots + P_{n-1} x \frac{dy}{dx} + P_n y = X,$$

Where $P_1, P_2, P_3 \ldots, P_n$ are constants and X is a function of x.

b) Solve $x^2 \frac{d^2 y}{dx^2} + 7x \cdot \frac{dy}{dx} + 5y = x^5$

B) Attempt any one. 07

c) Solve $\frac{d^2 y}{dx^2} - 4y = 2 \cdot \sin\left(\frac{1}{2} \cdot x\right)$

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

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Q.3 A) Attempt any one.   05

      a) Explain the method of solving equation $\frac{d^n y}{dx^n} = f(x)$

      b) Derive the Partial differential equation by the elimination of the arbitrary constants from the equation $\phi(x, y, z, a, b) = 0$.

  B) Attempt any one.   05

      c) Solve $\frac{dx}{mz-ny} = \frac{dy}{nx-lz} = \frac{dz}{ly-mx}$

      d) Form a Partial differential equation by eliminating the arbitrary function from $z = F(x^2 + y^2)$.

Q.4 Choose correct alternative.   10

    i) The integrating factor of the differential equation $\frac{dy}{dx} + Py = Q$ is _____.

      (a) $e^{\int P dx}$

      (b) $e^{-\int P dx}$

      (c) e^x

      (d) e^{Px}

    ii) The general solution of the differential equation $\frac{d^2 y}{dx^2} - a^2 y = 0$ is _____.

      (a) $y = (c_1 + c_2 x)e^{ax}$

      (b) $y = (c_1 + c_2 x)e^{-ax}$

      (c) $y = c_1 e^{ax} + c_2 e^{-ax}$

      (d) None of these

    iii) The particular integral of the differential equation $\frac{d^2 y}{dx^2} - y = 2 + 5x$ is _____.

      (a) $2 + 5x$

      (b) $-2 - 5x$

      (c) $-2 + 5x$

      (d) $2 - 5x$

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iv) The Solution of the Simultaneous equation $\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{z}$ is _____.

(a) $x = c_1y$ and $x = c_2z$

(b) $x = c_1y^2$ and $x = c_2z^2$

(c) $x = c_1x^2$ and $x = c_2z^2$

(d) None of the above

v) The Partial differential equation corresponding to the equation $z = (x + a)(y + b)$ is _____.

(a) $z = p^2q^2$

(b) $z = p + q$

(c) $z = p - q$

(d) $z = pq$

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