Total No. of Printed Pages: 02

SUBJECT CODE NO: Y- 2040
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. F.Y (Sem-I)
Examination March / April - 2023
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.

Q1   A) Attempt any one.   08

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 equation.
$\frac{d^n y}{dx^n} + P_1 \frac{d^{n-1}y}{dx^{n-1}} + \cdots + P_n y = X$,where $P_1, P_2, \ldots\ldots P_n$ are constants and X is a
function of x

B) Attempt any one   07

c) Solve $\frac{d^3 y}{dx^3} + \frac{d^2 y}{dx^2} - \frac{dy}{dx} - y = \cos(2x)$

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

Q2   A) Attempt any one   08
a) Explain the method of solving the differential equation
$x^2 \frac{d^n y}{dx^n} + P_1 x^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \cdots + P_{n-1} x \frac{dy}{dx} + P_n Y = X$,where
$P_1, P_2, \ldots\ldots, P_n$ constants and X is a function of x.

b) Solve $\frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} + y = 3e^{5/2x}$

B) Attempt any one   07

c) Solve $(2x - 1)^3 \frac{d^3 y}{dx^3} + (2x - 1) \frac{dy}{dx} - 2y = 0$

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

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Q3   A) Attempt any one   05

    a) Explain the method of solution of bimultaneous differential equation
$\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ where P,Q, R use functions of x,y,z

    b) With usual notation, 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) Attempt any one   05

    c) Solve $(2ax + by + g)dx + (2cy + bx + e)dy = 0$

    d) Form the partial differential equation by eliminating the arbitrary function from
$z = e^{ny}\phi(x - y)$

Q4 Choose the correct alternative   10

    i. The integrating factor of differential equation $x\frac{dy}{dx} - ay = x + a$ is … …..

      a) x^a b) $\frac{1}{x^a}$ c) $\frac{-a}{x}$ d) x^2

    ii. The partial differential equation correspond to _____
      a) Single independent variable
      b) More than one independent variable
      c) Single ordinary derivative
      d) None of these

    iii. The general solution of the differential equation
$\frac{d^n y}{dx^n} + P_1 \frac{d^{n-1} y}{dx^{n-1}} + \cdots + P_n y = X$ is
      a) y=C.F +P.I
      b) y=C.F –P.I
      c) y=complementary function
      d) none of these

    iv. The partial differential equation obtained by eliminating constants a and b from
$z = a(x + y) + b$ is _____
      a) pq =1   b) p=q   c) $P^2 = q^2$ d) none of these

    v. The particular integral of the differential equation
$\frac{d^2 y}{dx^2} + 2\frac{dy}{dx} + y = 2e^{2x}$ is _____
      a) $\frac{2}{9}e^{2x}$ b) $\frac{1}{9}e^{2x}$ c) $2e^{2x}$ d) e^{2x}

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