B-2022

Total No. of Printed Pages:03

SUBJECT CODE NO:- B-2022
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. F.Y. (Sem-I) Examination Oct/Nov 2019
Mathematics MAT - 102
Differential Equations

[Time: 01:30 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) Prove that the necessary and sufficient condition of the differential equation
$Mdx + Ndy = 0$, being exact is $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$.

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

B) Attempt any one:-   07

c) Solve the simultaneous equations:
$$\frac{dx}{dt} - 7x + y = 0$$
$$\frac{dy}{dt} - 2x - 5y = 0$$

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

Q.2   A) Attempt Any One:-   08

a) Explain the method of solving the differential equation
$$\frac{d^n y}{dx^n} + P_1 \frac{d^{n-1}y}{dx^{n-1}} + - - - - - - + P_n \cdot y = X,$$
Where P_1, P_2, ----------- P_n are constants and X is a function of x.

b) Explain the method of solving the differential equation.
$$(a + bx)^n \frac{d^n y}{dx^n} + P_1(a + bx)^{n-1} \frac{d^{n-1}y}{dx^{n-1}} + - - - - - + P_{n-1}(a + bx)\frac{dy}{dx} + P_n y = f(x)$$
where $P_1, P_2, - - - - - - P_n$ are constants.

B-2022

2019

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B) Attempt any one:-

   c) Solve $\dfrac{d^2y}{dx^2} - 5\dfrac{dy}{dx} + 6y = e^{4x}$

   d) Solve $x^2\dfrac{d^2y}{dx^2} - 2x\dfrac{dy}{dx} - 4y = x^4$

Q.3   A) Attempt any one:-   05

   a) With usual notation, prove that
$$\frac{1}{f(D)}e^{ax}.V = e^{ax}.\frac{1}{f(D+a)}.V$$
      where V be any function of x.

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

B) Attempt any one:-   05

   c) Solve $(a^2 - 2xy - y^2)dx - (x+y)^2dy = 0$

   d) Form the partial differential equation by eliminating arbitrary constants a and b from the equation.
$$z = ax + by + ab$$

Q.4   Choose the correct alternative: 10

   i)   The integrating factor of the differential equation $x\dfrac{dy}{dx} - ay = x + 1$ is ---------

      a) $\dfrac{1}{x^a}$ b) x^a c) $\dfrac{1}{x}$ d) $\dfrac{1}{a}$

   ii)   The general solution of the equation $\dfrac{d^2y}{dx^2} + 3\dfrac{dy}{dx} - 54y = 0$ is ----------

      a) $y = C_1e^{6x} + C_2e^{-9x}$
      b) $y = C_1e^{-6x} + C_2e^{3x}$
      c) $y = C_1e^{6x} + C_2e^{4x}$
      d) None of the above

   iii)   The particular integral of the equation $x^2\dfrac{d^2y}{dx^2} + 7x\dfrac{dy}{dx} + 5y = x^5$ is --------

      a) $\dfrac{x^5}{60}$ b) x^5 c) $\dfrac{x^5}{30}$ d) $\dfrac{x^5}{6}$

iv) The partial differential equation corresponding to $z = ax + by + ab$ is ------------
   a) z=px+qy
   b) z=pq
   c) z=px+qy+pq
   d) None of the above

v) The ordinary differential equation and partial differential equation are differ by
   a) Their number of independent variable
   b) Their number of dependent variable
   c) Their total derivative
   d) None of the above