

**VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY
(VSSUT), ODISHA
Even Mid Semester Examination for session 2024-25
B.Tech. (All Branches) 2nd Semester.**

**Full Mark-30
B.Tech. Mathematics-II
Answer All Questions. Time-90 Minutes**

The figure on the right-hand margin indicates marks. Symbols carry usual meaning.

1. Answer the following questions. [2×3]

- a) Find the integrating factor of the differential equation
 $2x \tan y \, dx + \sec^2 x \, dy = 0$ -CO1
- b) Solve the differential equation: $xy'' + 2y' = 0$. -CO2
- c) Find the order of the differential equation $x \, y^{(6)} + 2y^{(2)} = 0$ -CO3

2. [4+4]

- (a) Find an integrating factor, convert to exact form and solve the differential equation: $2 \sin(y^2) \, dx + xy \cos(y^2) \, dy = 0$. -CO1
- (b) A thermometer reading 30°C is brought into a room whose temperature is 18°C . One minute later thermometer reading is 26°C . How long does it take until the reading is 20°C ?

OR

- (c) Solve the non-linear differential equation:
 $2xyy' + (x-1)y^2 = x^2e^x$ -CO1
- (d) Solve the Euler-Cauchy differential equation:
 $x^2y'' + 7xy' + 13y = 0$, $y(1) = 0$, $y'(1) = 5$ -CO1

3. [4+4]

- (a) Solve the differential equation $y'' + 9y = 6 \cos 3x$,
 $y(0) = 1$, $y'(0) = 0$ -CO2

- (b) Solve the differential equation
 $y'' + 2y' - 35y = 12e^{2x} + 28 \sin 3x$ -CO2

OR

- (c) Solve the differential equation $y'' + 9y = \sec 3x$ by variation of parameters -CO2
- (d) Find the current in RLC circuit $R = 8 \, \text{ohms}$, $L = 2 \, \text{henry}$, $C = 0.1 \, \text{Farad}$, $E = 160 \cos 5t \, \text{volts}$. -CO2

4. [4+4]

- (a) Solve the differential equation $y'' - xy' = 0$ -CO3
- (b) One solution of the differential equation $x^2y'' - 7xy' + 15y = 0$ is given as $f_1(x) = x^3$. Find the second solution. -CO3

OR

- (c) Express $f(x) = 10x^3 - 3x^2 - 6x + 9$ in terms of Legendre polynomial. -CO3
- (d) One solution of the differential equation $x^2y'' - xy' + y = 0$ is given as $f_1(x) = x$. Find the second solution. -CO3