

AUTUMN MID SEMETER EXAMINATION-2022
Subject: Differential Equations & Linear Algebra
Code: MA 11001

SET-1
B. Tech.
1st Semester
(Regular) S.A.S-2022



Full Marks: 20

Time: 1.5 Hrs

Answer any **FOUR** QUESTIONS including question No. 1 which is compulsory. The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only

1. Answer the following questions

[5×1=5]

(a) Find the general solution of the differential equation $xy' = x + y$.

(b) Find the orthogonal trajectory for $x = ce^{\frac{y}{x}}$.

(c) What will be the exact differential equation whose solution is $\sin x - \cos x - x^2 + y = c$, where c is an arbitrary constant?

(d) Apply the operator $(D^2 - 2D + I)$ on $\sinh(x + 2)$.

(e) Find an integrating factor for the ODE $\frac{dx}{dy} = 2(x - 1) \tanh 2y$.

2. (a) Find the particular solution of $xy' = y + 4x^5 \cos^2(y/x)$, $y(2) = 0$

[3]

(b) Reduce to first order and then solve $y'' + (y')^3 \sin y = 0$

[2]

3. (a) Find the integrating factor of the following differential equation which will make it exact. Hence solve the equation.
 $(3xy - 2y^2)dx + (x^2 - 2xy)dy = 0$.

[3]

(b) Find a general solution of $(D^2 + 6D + 13I)y = 0$.

[2]

4. (a) Find a differential equation for which the given $y(x)$ is a general solution and then determine the constants so that the given initial conditions are satisfied.
 $y(x) = e^x(c_1 \cos x + c_2 \sin x)$, $y(0) = 1$, $y'(0) = 3$.

[3]

(b) Find a general solution of the differential equation
 $y' + 2y = 4 \cos 2x$.

[2]

5. (a) A thermometer, reading 10°C is brought into a room whose temperature is 23°C . Two minutes later the thermometer reading is 18°C . Find the temperature in the thermometer after 2 hours.

[3]

(b) Find a basis of solutions of the ODE by method of reduction of order.
 $x^2 y'' + 3xy' + y = 0$, $y_1 = \frac{1}{x}$

[2]