DTL Assignment 2

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COEP Technological University

(COEP Tech)
A Unitary Public University of Government of Maharashtra
w.e.f 21st June 2022
(Formerly College of Engineering Pune)

(MA-20001) Ordinary Differential Equation And Multivariate Calculus

Date : December 20, 2022 **Duration :** 1 hour

Examination : Internal Test 1 **Maximum Marks** : 20

Programme : S.Y B.Tech Sem. I **Academic Year :** 2022-23

Name: **MIS No. :**

Instructions:

1. All questions are compulsory.

2. All symbols have their usual meanings.

3. Figures to right indicate course outcomes and full marks.

4. Mobile phones and programmable calculators are not allowed.

5. Writing anything on question paper , exchange of stationary, calculator is strictly not allowed.

6. Write all subparts of question of question together.

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1 Solve the following:

1.1 SECTION - A

Q.1) Solve the following:

(a) $3x(xy-2)dx + (x^3+2y)dy = 0$ [CO 2] [2]

(b) $(2\cos(y) + 4x^2)dx - x\sin(y)dy = 0$ [CO 3] [3]

Q.2) Find a homogeneous linear second order ordinary differential equation whose solution is the set of all straight lines in the xy-plane. [CO 1] [1]

Q.3) State whether the following differential equations are linear or non-linear, justify and solve:

(a) $xy' + 2y = \frac{e^{3x}}{x}$, $x > 0$ with $y(1) = 1 + \frac{e^3}{3}$. [CO 2] [2]

(b) $x^2 y\frac{dy}{dx} - xy^2 = 1$. [CO 2] [2]

Q.4) If x^2 and 1 are solutions of $yy'' - xy' = 0$ then so is any linear combination of these. State true or false and justify. [CO 4] [2]

1.2 SECTION - B

Q.5) Find a linear ordinary differential equation for which the functions $e^{-x}\cos 2x$ and $e^{-x}\sin 2x$ are linearly indepedent solutions. [CO 3] [3]

OR

Q.6) Find $\det(AB)$ if $A = \begin{bmatrix} \sin x & \cos x \\ \cos x & -\sin x \end{bmatrix}$ and $B = \begin{bmatrix} 2 & \tan x \\ \cos x & 0 \end{bmatrix}$.

1.3 SECTION - C

Q.7) Solve the following equations simultaneously: [CO 3] [3]

$$\begin{aligned} 2x - 5y + 3z &= 6 \\ x - y + 7z &= 0 \\ 3y &= 2 \end{aligned}$$

Q.8) Find the value of following definite integrals: [CO 2] [2]

(a) $\int_0^1 \sin x \, dx$ (b) $\int_0^1 \frac{\ln x}{x} \, dx$

Q.9) Let k be a number. Then matrix $A = \begin{bmatrix} k & 0 & \cdots & 0 \\ 0 & k & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & k \end{bmatrix}$ is ? [CO 2] [2]

(a) Triangular Matrix
(b) Idempotent Matrix
(c) Scalar Matrix
(d) None of the Above