Assignment 2

ADITYA INGLE
MIS: 112103050

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COEP Technological University

(COEP Tech)

End Semester Examination
Ordinary Differential Equation And Multivariate Calculus
(MA-16001)

Date : February 6, 2023 **Duration :** 1 hour

Branches : All **Max marks** : 60
Programme : S.Y B.Tech **Semester :** I

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.

1 Maths Paper

1.1 SECTION - A

1) Which of the following sequences converge and which diverge? Find the limit of each convergent sequence and justify your answers.

(a) $a_n = (-1)^n(1 - \frac{1}{n})$ (b) $a_n = \frac{\ln n}{n^{\frac{1}{n}}}$

2) For any $\triangle ABC$, prove that -

$$a\sin(B-C) + b\sin(C-A) + c\sin(A-B) = 0$$

3) Find the value of

$$\sqrt{3}\csc(20^\circ) - \sec(20^\circ)$$

.

4) Find the value of $f(x) = \frac{tan(3x)\ln(x+1)}{\sqrt[3]{\sin^6 x}}$ when x tends to 0.

5) Find $\frac{dy}{dx}$ for $y = e^{6\log_e(x-1)}$, $x > 1$.

1.2 SECTION - B

6) Find the determinant of $\begin{bmatrix} 3 & 5 \\ 2 & 4 \end{bmatrix}$.

7) 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

8) Solve the following equations simultaneously:

$$2x - 5y + 3z = 6 \quad (1)$$
$$x - y + 7z = 0 \quad (2)$$
$$3y = 2 \quad (3)$$

9) Find the value of following definite integrals:

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

10) Let k be a number. Then the matrix $A = \begin{bmatrix} k & 0 & \cdots & 0 \\ 0 & k & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & k \end{bmatrix}$ is called as ?

(A) Triangular Matrix
(B) Idempotent Matrix
(C) Scalar Matrix
(D) None of the Above

1.4 SECTION - D

11) Solve the equation $x^2 + 6x + 8$.

12) Solve the following equations:

a) $x^2 + 2x + 3 = 0$
b) $x^3 - 7x + 3 = 15$
c) $x^5 + 2x + 1 = 0$