N21-02231

TED (15/19) - 2002
(Revision-2015/19)

Reg.No.....
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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/ COMMERCIAL PRACTICE - NOVEMBER-2021

ENGINEERING MATHEMATICS - II

[Maximum marks: 75] (Time: 2.15 Hours)

PART – A

I. Answer any *three* questions in one or two sentences. Each question carries 2 marks

1. If $\vec{a} = 5\vec{i} - \vec{j} - 3\vec{k}$ and $\vec{b} = \vec{i} + 3\vec{j} - 5\vec{k}$, show that $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are orthogonal to each other.
2. If $\begin{vmatrix} 3x & 7 \\ 2 & 3 \end{vmatrix} = \begin{vmatrix} 4 & 2 \\ 2 & 2 \end{vmatrix}$, find x.
3. Evaluate $\int tan^2 x \ dx$.
4. Write the order and degree of the differential equation $(\frac{dy}{dx})^2 + \frac{1}{\frac{dy}{dx}} = 2$.
5. Find the integrating factor of $\frac{dy}{dx} - 4y = e^x$. (3x2=6)

PART B

II. Answer any four of the following questions. Each question carries 6 marks

1. The position vectors of the vertices of a triangle are $4\vec{i} + 5\vec{j} + 6\vec{k}$, $5\vec{i} + 6\vec{j} + 4\vec{k}$, $6\vec{i} + 4\vec{j} + 5\vec{k}$. Show that the triangle is equilateral.
2. Find the middle terms in the expansion of $(2x + \frac{3}{x})^9$.
3. Solve the system of equations using Crammer's rule
   $\frac{2}{x} + \frac{3}{y} = 5 \qquad \frac{2}{x} + \frac{5}{y} - 3 = 0$.
4. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, show that $A^2 - 4A - 5I = 0$.

5. Evaluate $\int e^x \cos x \, dx$.

6. Find the area enclosed between the parabola $y = x^2 - x - 2$ and the x – axis.

7. Solve the differential equation $x(1 + y^2)\,dx + y(1 + x^2)\,dy = 0$.

(4x6=24)

PART C

Answer any of the three units from the following. Each full question carries 15 marks

UNIT - I

III a) Find the area of triangle ABC, given that the position vectors of A, B, C are $3\vec{i} + \vec{j}$, $5\vec{i} + 2\vec{j} + \vec{k}$ and $\vec{i} - 2\vec{j} + 3\vec{k}$. 5

b) Find the work done by a force $\vec{F} = \vec{i} + 2\vec{j} + 5\vec{k}$ acting on a body if the body is displaced from the point A (2, -3, 1) to a point B (5, 0, 7) along the straight line AB. 5

c) Expand $(3x - \frac{y}{2})^4$ using binomial theorem. 5

OR

IV a) Find the value of μ for which the vectors $3\vec{i} + 2\vec{j} + 9\vec{k}$ and $\vec{i} + \mu\vec{j} + 3\vec{k}$ are Parallel. 5

b) Find the projection of $\vec{i} - 2\vec{j} + 2\vec{k}$ on $2\vec{i} + \vec{j} - 2\vec{k}$. 5

c) Find the term independent of x in the expansion of $(3x^2 - \frac{1}{2x^3})^{10}$. 5

UNIT II

V a) Solve using determinants

$x + y - z = 4$ $\quad 3x - y + z = 4$ $\quad 2x - 7y + 3z = -6$. 5

b) If $A = \begin{bmatrix} 2 & -1 \\ 3 & 0 \\ 1 & 1 \end{bmatrix}$, $C = \begin{bmatrix} 2 & 3 & 4 \\ 1 & 0 & 2 \end{bmatrix}$, verify that $(AB)^T = B^T A^T$. 5

c) For the matrix $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 3 & 0 \\ 18 & 2 & 10 \end{bmatrix}$, Show that A Adj(A) = **0**. 5

OR

VI a) Solve for x, if $\begin{vmatrix} 3 & 1 & 9 \\ 2x & 2 & 6 \\ x^2 & 3 & 3 \end{vmatrix} = 0$. 5

b) Express the matrix A = $\begin{bmatrix} 1 & 4 & 5 \\ 2 & 2 & 3 \\ 3 & 1 & 0 \end{bmatrix}$ as the sum of symmetric and skew symmetric matrices. 5

c) Solve the system of equations $3x + y - z = 3$, $-x + y + z = 1$, $x + y + z = 3$ by finding the inverse of the coefficient matrix. 5

UNIT III

VII a) Evaluate $\int \frac{cos2x}{cos^2x\ sin^2x}$ dx. 5

b) Evaluate $\int tan^{-1}x$ dx. 5

c) Evaluate $\int_0^{\frac{\pi}{2}} \sin 3x\ cosx$ dx. 5

OR

VIII a) Evaluate $\int (1 + e^{tanx})\ sec^2 x$ dx. 5

b) Evaluate $\int x^3\ e^{-2x}$ dx. 5

c) Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{1 + sin2x}$ dx. 5

UNIT IV

IX a) Find the area of a circle of radius 'r' units using integration. 5

b) Find the volume of generated by rotating the area under the curve $ay^2 = x^2(a-x)$, the x – axis and the ordinates x = 0 and x = a about the x – axis. 5

c) Solve the differential equation $\frac{d^2y}{dx^2} = e^x + cosx$. 5

OR

X a) Find the area enclosed between the line $2x + y = 1$ and the curve $y = x^2 - 6x + 4$ 5

b) Find the volume of the solid generated by revolving the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$, about the x – axis. 5

c) Solve : $x\frac{dy}{dx} + 3y = 5x^2$. 5
