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Reg. No……………………
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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, APRIL – 2024

ENGINEERING MATHEMATICS - II

[Maximum Marks: **100**] [Time: **3** Hours]

PART-A

[Maximum Marks: **10**]

I. (Answer ***all*** questions in one or two sentences. Each question carries ***2*** marks)

1. Find length of the vector $3\hat{\imath} + 4\hat{\jmath} + \hat{k}$.
2. Solve for x if $\begin{vmatrix} x & 12 \\ 3 & x \end{vmatrix} = 0$.
3. If A=$\begin{bmatrix} 7 & 8 & 9 \\ 4 & 5 & 6 \end{bmatrix}$, B= $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 5 & 6 \end{bmatrix}$ find $5A - 2B$.
4. Evaluate$\int sin^2x\,dx$.
5. Find the order and degree of the differential equation $3\frac{d^3y}{dx^3} - 6\left(\frac{dy}{dx}\right)^3 - 4y = 0$.

(5 x 2 = 10)

PART-B

[Maximum Marks: **30**]

II. (Answer ***any five*** of the following questions. Each question carries ***6*** marks)

1. If $\vec{a} = 3\hat{\imath} + 2\hat{\jmath} - 2\hat{k}, \vec{b} = 2\vec{\imath} + 3\hat{\jmath} + \hat{k}\ .\ Calculate\ (\vec{a} + \vec{b}) \times (\vec{a} - \vec{b})$.
2. Find term independent of x in the expansion of$\left(x^3 + \frac{3}{x^2}\right)^{15}$.
3. Solve the following system of equation by finding inverse of the coefficient matrix
   $x + y - z = 4$
   $3x - y + z = 4$
   $2x - 7y + 3z = -6$
4. Express the matrix A=$\begin{bmatrix} 3 & 4 & 5 \\ 2 & 4 & 3 \\ 3 & 1 & 2 \end{bmatrix}$, as the sum of symmetric and skew symmetric matrices.
5. Evaluate $\int_0^{\frac{\pi}{2}} \sin 2x.cosx\ \ dx$.
6. Find volume of a sphere of radius ‘r’ using integration.
7. Solve $\frac{dy}{dx} + y\tan x = cos^2x$.

(5 x 6 = 30)

PART-C

[Maximum Marks: **60**]

(Answer ***one*** full question from each unit. Each full question carries **15** marks)

UNIT – I

III. a. Find a unit vector perpendicular to the vectors.

$\vec{a} = \hat{\imath} - \hat{\jmath} + \hat{k}$ *and* $\vec{b} = 2\hat{\imath} + \hat{\jmath} - \hat{k}$ (5)

b. Find moment about the point $\hat{\imath} + 2\hat{\jmath} - \hat{k}$ of a force represented by $\hat{\imath} + 2\hat{\jmath} + \hat{k}$ *acting* through the point $2\hat{\imath} + 3\hat{\jmath} + \hat{k}$. (5)

c. Find angle between the vectors $\vec{a} = 2\hat{\imath} + 2\hat{\jmath} - \hat{k}$ and $\vec{b} = 6\hat{\imath} - 3\hat{\jmath} + 2\hat{k}$. (5)

OR

IV. a. A particle is acted on by two forces $4\hat{\imath} + \hat{\jmath} - 3\hat{k}$ and $3\hat{\imath} + \hat{\jmath} - \hat{k}$ is displaced from the point $\hat{\imath} + 2\hat{\jmath} + \hat{k}$ to the point $5\hat{\imath} + 4\hat{\jmath} + \hat{k}$. Find the work done by the forces. (5)

b. Find area of a triangle whose vertices are

$A(\hat{\imath} - \hat{k}), B(2\hat{\imath} + \hat{\jmath} + 5\hat{k})$ and $C(\hat{\jmath} + 2\hat{k})$. (5)

c. Find middle term of $\left(x^2 + \frac{2}{x}\right)^7$. (5)

UNIT – II

V. a. If A= $\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, Prove that $A^2 - 4A - 5I = 0$. (5)

b. Solve by determinant method

$$x + 2y - z = -3$$
$$3x + y + z = 4$$
$$x - y + 2z = 6$$
(5)

c. Find the inverse of matrix A = $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ (5)

OR

VI. a. If A=$\begin{bmatrix} 5 & 3 \\ 2 & 2 \end{bmatrix}$, B= $\begin{bmatrix} 7 & 5 \\ 4 & 3 \end{bmatrix}$ Show that $(AB)^{-1} = B^{-1}A^{-1}$. (5)

b. If A − B=$\begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$, A+B= $\begin{bmatrix} 1 & 1 \\ 3 & 2 \end{bmatrix}$, Find A and B. (5)

c. If A = $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 2 \\ 1 & 2 & 0 \end{bmatrix}$; B= $\begin{bmatrix} 1 & -2 & 3 \\ 2 & 3 & -1 \\ -3 & 1 & 2 \end{bmatrix}$, find AB and BA and prove that AB$\neq BA$

(5)

UNIT- III

VII. a. Evaluate $\int x^2 \sin x \, dx$. (5)

b. Evaluate $\int \frac{4+5\,sinx}{cos^2 x}\ dx$. (5)

c. Evaluate $\int_0^{\frac{\pi}{4}} \sin x. \sin 3x. dx$. (5)

OR

VIII. a. Evaluate $\int (e^{tan^{-1}x})^2 . \frac{1}{1+x^2} dx$. (5)

b. Evaluate $\int_2^3 \frac{x^2+1}{x^3+3x} dx$. (5)

c. Evaluate$\int_0^3 x^2 \log x \ \ dx$. (5)

UNIT - IV

IX. a. Find area enclosed between the curves $y = x^2$ $and\ 2x + y - 3 = 0$. (5)

b. Find the volume generated when the portions of the parabola $y^2 = 4x$ and $x = 0$ and $x = 2$ revolves about the $x - axis$. (5)

c. Solve $\frac{dy}{dx} = \frac{xy^2+x}{yx^2+y}$. (5)

OR

X. a. Find the area bounded by one arch of the curve $y = 2 \sin 3x$ and the X-axis. (5)

b. Find the volume generated by the area under the curve $y^2 = x^2(a - x), the\ X - axis$ ordinates at $x=0$ and $x=a$ when revolves about $X - axis$. (5)

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

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