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(Revision -2015/19)

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER – 2022

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. Solve for 'x' if $\begin{vmatrix} x & 12 \\ 3 & x \end{vmatrix} = 0$
2. Find the 4th term of $(x + \frac{1}{x})^{10}$
3. Evaluate $\int tan^2$x dx.
4. Evaluate $\int_0^1 \frac{1}{1+x^2}$ dx.
5. Solve $\frac{d^2y}{dx^2}$=sinx. (5 x 2 = 10)

PART-B

[Maximum Marks: **30**]

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

1. Show that the points whose position vectors are $-2\hat{a} + 3\hat{b} + 5\hat{c}, \hat{a} + 2\hat{b} + 3\hat{c}$, and $7\hat{a} - \hat{c}$, are collinear.
2. Find the middle terms in the expansion of $(2x+\frac{3}{x})^9$
3. Solve the following system of equations using determinants.x+2y-z=3
   3x+y+z=4, x-y+2z=6
4. 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. Evaluate $\int_0^{\pi/2} sin^3$xdx
6. Find the area enclosed by one arch of the curve y=sin3x and the x axis.
7. Solve
   $\frac{dy}{dx} + y\ cotx =$ Cosecx (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 the projection of the line joining (1,-2,-1) to (3,1,1) on the vector 4i-3j+12k (5)

(b) Find the work done by the force F=$\hat{\imath} + 2\hat{\jmath} + \hat{k}$ acting on a particle which is displaced from the point with position vector $2\hat{\imath} + \hat{\jmath} + \hat{k}$ to the point with position vector $3\hat{\imath} + 2\hat{\jmath} + 4\hat{k}$ (5)

(c) Find the term independent of 'x' in the expansion of $\left(x^2 - \frac{1}{x}\right)^9$ (5)

OR

IV. (a) Find the area of a triangle whose vertices are represented by the vectors $A(\hat{\imath} + 3\hat{\jmath} + 2\hat{k})$, $B(2\hat{\imath} - \hat{\jmath} + \hat{k})$ and $C(-\hat{\imath} + 2\hat{\jmath} + 3\hat{k})$. (5)

(b) Find the 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) Expand $\left(x^3 - \frac{1}{x^2}\right)^5$ binomially. (5)

UNIT - II

V. (a) Find A and B if A+2B=$\begin{bmatrix} 2 & 1 & 0 \\ 1 & -1 & 2 \end{bmatrix}$ 2A+3B=$\begin{bmatrix} 1 & 2 & -1 \\ 2 & 0 & 1 \end{bmatrix}$ (5)

(b) If A=$\begin{bmatrix} 1 & 0 & 0 \\ -2 & 1 & -1 \\ 3 & 0 & 1 \end{bmatrix}$ Prove that A^3-3A^2+3A-I=0 (5)

(c) If $\begin{vmatrix} x & 1 & 3 \\ 4 & 1 & -1 \\ 2 & 0 & 3 \end{vmatrix} = \begin{vmatrix} 2 & -1 & 1 \\ 3 & 0 & 1 \\ -1 & 0 & 2 \end{vmatrix}$ Find 'x'. (5)

OR

VI. (a) Find the inverse of $\begin{bmatrix} 1 & 0 & 2 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$ (5)

(b) Find the values of x,y,z and w that satisfy the matrix relationship

$$\begin{bmatrix} x+3 & 2y+4 \\ z+4 & 4x+5 \\ w-3 & 3w+1 \end{bmatrix} = \begin{bmatrix} 1 & -5 \\ -4 & 2x+1 \\ 2w+5 & -23 \end{bmatrix}$$ (5)

(c) Show that every square matrix can be expressed as the sum of two matrices of which one is symmetric and the other is skew symmetric. (5)

UNIT- III

VII. (a) Evaluate (i) $\int \frac{\cos x}{\sqrt{\sin x}} dx$ (3)

(ii) $\int sec^2(7x+2)dx$ (2)

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

(c) $\int_0^{\pi/2} sin3x.cosx\, dx$ (5)

OR

VIII. (a) Evaluate $\int \frac{2+3\sin x}{\text{Cos}^2 x} dx$ (5)

(b) Evaluate $\int \frac{sin^{-1}2x}{\sqrt{1-4x^2}} dx$ (5)

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

UNIT - IV

IX. (a) Find the area enclosed between the curve $y=x^2$ and the straight line $y=3x+4$. (5)

(b) Find the volume generated when the portion of the parabolas $y^2=4x$ between $x=0$ 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 volume of the ellipsoid when the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is rotated about the x-axis. (5)

(b) Solve $(1+x^2)\frac{dy}{dx} + y = e^{tan-1}x.$ (5)

(c) Find the area bounded by the curve $y=x^2+x$ and the x-axis. (5)

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