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(Revision-2015)

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE, APRIL-2020

ENGINEERING MATHEMATICS -II

[Maximum marks: 75]

(Time: 2.15 Hours)

PART – A

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

- I. (1). Define a vector quantity and give an example of a vector quantity.
(2). State binomial theorem for a positive integer.
(3). Define transpose of a matrix.
(4). Evaluate $\int x^2 dx$.
(5). Find the degree and order of the differential equation: $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 3y = 0$ (3 x 2 = 6)

PART – B

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

- II. (1). Find the middle term of $(2x - \frac{3}{x})^9$
(2). Solve using Cramer's rule, given $2x+3y+z = 11$, $2x-y+4z = 13$, $3x+4y-5z = 3$
(3). If $A = \begin{pmatrix} 3 & 1 & 2 \\ -1 & 2 & 3 \\ 2 & -5 & 7 \end{pmatrix}$ and $B = \begin{pmatrix} -2 & 4 & 1 \\ 3 & -1 & 2 \\ 4 & 1 & 3 \end{pmatrix}$ be two matrices. Compute AB and BA.
(4). Find $\int x^2 \sin x dx$.
(5). Evaluate $\int_0^{\frac{\pi}{2}} \cos 4x \cos x dx$
(6). Find the volume of the solid generated by revolving one arch of the curve $y = 3 \sin 2x$ about the X-axis.
(7). Solve $\frac{d^2y}{dx^2} = \cos x$. (4 x 6= 24)

PART – C

(Answer *any of the three units* from the following. Each question carries 15 marks)

UNIT –I

- III.** (a). Find the unit vector perpendicular to the vectors $5i-2j+4k$ and $i+3j+2k$. (5)
- (b). Find the work done in moving an object from A with position vector $2i-6j+7k$ to the point B with position vector $3i-j+5k$ by a force $i+3j-k$. (5)
- (c). Find the moment of the force about the point whose position vector is $2i+j-k$ where the force is given by $4i+k$ acting through the point $i-j+2k$. (5)

OR

- IV.** (a). Expand $(x - \frac{1}{x})^6$ (5)
- (b). Find the coefficient of x^{12} in the expansion of $(x^2 + \frac{1}{x^2})^{10}$ (5)
- (c). Find the constant term in the expansion of $(2\sqrt{x} - \frac{1}{x^2})^{10}$ (5)

UNIT-II

- V.** (a). Solve for x, if $\begin{vmatrix} x & 2x & x \\ x & 3x & 3 \\ 1 & 2 & 2 \end{vmatrix} = 0$ (5)
- (b). Solve $\frac{2}{x} + \frac{3}{y} = 5$
 $\frac{2}{x} + \frac{5}{y} = 3$ (5)
- (c). If $A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}$, $B = \begin{pmatrix} 7 & 8 & 9 \\ 10 & 11 & 12 \end{pmatrix}$, find $5A - 2B$. (5)

OR

- VI.** (a). Find the inverse of the matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 5 & 0 \\ 2 & 4 & 3 \end{pmatrix}$ (5)
- (b). Express the matrix $A = \begin{pmatrix} 2 & 0 & 0 \\ 2 & 1 & 0 \\ 2 & 1 & 1 \end{pmatrix}$ as the sum of a symmetric and a skew symmetric matrices. (5)
- (c). If $A = \begin{pmatrix} 0 & 2 \\ 2 & 0 \end{pmatrix}$, $B = \begin{pmatrix} 2 & 0 \\ 0 & -2 \end{pmatrix}$, prove that $A^2 = B^2$ (5)

UNIT-III

VII. (a). Evaluate (i). $\int x\sqrt{x}dx$. (ii). $\int \tan^2 x dx$ (5)

(b). Prove that (i). $\int \cot x dx = \log(\sin x) + c$. (ii). $\int \frac{1}{x \log x} dx = \log(\log x) + c$ (5)

(c). Evaluate $\int \operatorname{cosec} x dx$. (5)

OR

VIII. (a). Evaluate $\int x^2 e^x dx$. (5)

(b). $\int_0^{\frac{\pi}{2}} \sqrt{1 + \sin x} dx$ (5)

(c). Evaluate $\int e^{\tan x} \sec^2 x dx$ (5)

UNIT-IV

IX. (a). Find the area included between one arch of the curve $y = \sin x$ and the X-axis. (5)

(b). Find the area of a circle of radius a using integration. (5)

(c). Find the volume of a right circular cone of radius r and height h using integration. (5)

OR

X. (a). Solve $\frac{dy}{dx} + y \tan x = \sec x$. (5)

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

(c). Solve $\frac{d^2y}{dx^2} = xe^x + \sin x$. (5)