EN 14 101 – ENGINEERING MATHEMATICS – I
(common for all B.Tech - programmes)

MODEL QUESTION PAPER

Time : 3 hrs. Total Marks : 100

Part – A
(Answer any 8 questions)

1. Evaluate line $(\text{Cos } x)^{1/x^2}$
$x \to 0$

2. Find the centre of curvature of the parabola $y^2 = 12x$ at the pt : (3,6)

3. Find the radius of curvature at the point $\left(\frac{3a}{2}, \frac{3a}{2}\right)$ on the curve $x^3 + y^3 = 3axy$

4. Discuss the convergence of $\frac{5}{2} - \frac{7}{4} + \frac{9}{6} - \frac{11}{8}$ ....

5. Discuss the convergence of $\sum_{n=1} \frac{n^2}{3^n}$

6. Find the eigen values of the matrix A = $\begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$

7. Find the rank of the matrix A = $\begin{pmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{pmatrix}$

8. Find the half range cosine series for the function $f(x) = x$ in the range $0 \le x \le \pi$

9. Show that a constant 'C' can be expanded in an infinite series $\frac{4C}{\pi}\left\{sinx + \frac{sin3x}{3} + \frac{sin5x}{5} \ldots\ldots\ldots\right\}$
In the range $0 < x < \pi$

10. Develop $f(x)$ in Fourier series in the interval (-2 , 2) if $f(x) \begin{cases} = 0 & -2 < x < 0 \\ = 1 & 0 < x < 2 \end{cases}$

8×5=40 Marks

Part B

Answer section (a) or section (b) of each question. Each question carries 15 Marks.

11 (a). Find the equivalent of $\frac{\delta^2 u}{\delta x^2} + \frac{\delta^2 u}{\delta y^2}$ in polar coordinates

OR

(b) Give the extreme values of the function $F(x, y) = x^3 y^2 (12 - x - y)$

12. (a) Discuss the convergence of the series.................

$$x + \frac{2^2 x^2}{2!} + \frac{3^3 x^3}{3!} + \frac{4^4 x^4}{4!} + \ldots\ldots\ldots\ldots$$

(b) If $y = \sin(m \sin^{-1} x)$ show that
$(1-x^2)\, Y_{n+2} - (2n+1)\, x\, Y_{n+1} + (m^2 - n^2)\, Y_n = 0$

13. (a) find that half range cosine and sine series of the function
$f(x) = x+1$ in the range $0 < x < \pi$

OR

(b) Obtain the first 3 coefficients in the Fourier sine series for y, where y is given in the following table

X :	0	1	2	3	4	5
Y :	4	8	15	7	6	2

14. (a) Verify Cayley Hamilton theorem for the matrix $A = \begin{pmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{pmatrix}$ and hence find inverse of A?

OR

(b) Reduce the quadratic form $2X_1^2 + 6X_2^2 + 2X_3^2 + 8X_1X_3$ to canonical form by orthogonal transformation. Also find the nature of the quadratic form.

15 x 4 = 60 marks.

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