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Roll No. ....

Total No. of Questions : 5]

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EX-69

B.Tech. Ist Semester (CSE, IT & Electronics)

Examination, 2022-23

Engeening Mathematics-I

Paper - BE - 101

Time : 3 Hours]

[Maximum Marks : 60

Note : - Attempt all questions. All question carry equal marks.

Attempt any two from each questions.

1. (a) Explain the concept of Evolutes and involutes with suitable examples.

(b) Prove that

$$\beta(m,n)=\frac{\Gamma m\,\Gamma n}{\Gamma m+n}$$

(c) Test the convergence of

$$\int_0^{\infty} e^{-x}dx$$

2. (a) Find the stationary points for finding maxima and minima of the function $f(x,y)=\sin x.\sin y.\sin(x+y)$.

(b) Find Maclaurin series expansion for $\frac{x}{\sqrt{1-x^2}}$

(c) Use L' hospital's rule to find the limit of -

$$\lim_{z\to\infty}\frac{z^2+e^{4z}}{2z-e^z}$$

3. (a) Find the fourier sine series for the function $f(x)=e^{an}$ for $0<x<\pi$

(b) Test for the convergence of the series

$$\frac{1}{1.2.3}+\frac{1}{2.3.4}+\frac{1}{3.4.5}+\ldots\ldots\ldots$$

(c) Find the taylor series for $f(x) = \frac{1}{x^2}$ about $x = -1$

4. (a) Prove that the set of all vectors in a plane over the field of real numbers is a vector space with respect to vector addition and scalar multiplication.

(b) Find whether the set of vectors $(2, 3, 1)$ $(-1, 4, -2)$, $(1, 18, -4)$ is linearly independent or not in R^3.

(c) Show that the "projection mapping"

$f : R^3 \to R^3$ into the xy - plane given by $f(x, y, z) = (x, y, o)$ is linear.

5. (a) Determine the values of K such that the rank of the matrix A is 3 where -

$$A = \begin{bmatrix} 1 & 1 & -1 & 0 \\ 4 & 4 & -3 & 1 \\ K & 2 & 2 & 2 \\ 9 & 9 & K & 3 \end{bmatrix}$$

(b) Find the eigen values and corresponding eigen vectors of the matrix.

$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$

(c) Find the eigen values of matrix

$A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ and verify Cayley Hamilton theorem for matrix A.

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