Exam.Code:0933
Sub. Code: 33745

2076
B.E. (Electrical and Electronics Engineering)
Third Semester
BS-EE-305: MATH-III

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: ***Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section. All questions carry 10 marks.***

x-x-x

1. (a) State a necessary and sufficent condition for consistency of $AX = B$.

   (b) Define basis of a vector space. Can a finite dimensional vector space have an infinite basis?

   (c) Define diagonalizable matrix. Is very diagonalizable matrix invertible?

   (d) Define analytic function. Can a function satisfy C-R equations at a point but fail to be analytic?

   (e) Define linear fractional transformation. Do linear fractional transformations preserve cross-ratio?

SECTION-A

2. (a) Explain elementary row operations and row equivalence. Reduce the system to echelon form and solve: $x + y + z = 6, 2x + 3y + z = 11, 3x + 4y + 2z = 16$.

   (b) Solve the system: $AX = 0$, where $A = \begin{bmatrix} 1 & 2 & -3 \\ 1 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$. Also find rank of A.

   (c) Define vector space and subspace with suiatble example. $(3 + 3 + 4)$

3. (a) Define a vector space over a field F. State all the axioms of a vector space and verify that $R^n(R)$ with usual addition and scalar multiplication is a vector space.

   (b) Explain the concepts of basis and dimension of a vector space. Why is the basis not unique? Find a basis and dimension of the vector space spanned by the set of vectors: $S = \{(1,1,3), (1,2,3), (2,4,6)\}$.

4. (a) Verify Cayley-Hamilton theorem for the matrix: $A = \begin{bmatrix} 1 & 2 & 0 \\ -1 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$. Also find A^{-1} and eigenvalues of A.

   (b) Find a linear transformation $T: R^3 \rightarrow R^3$ whose range space is spanned by the vectors $(1,2,3), (4,5,6)$.

P.T.O.

SECTION-B

5. (a) Define exponential and logarithmic functions of complex variable. Discuss their properties also.

   (b) Solve: $\sin z = 50$.

   (c) Prove that the real and imaginary parts of an analytic function are harmonic conjugate. $(4 + 3 + 3)$

6. (a) If f(z) is analytic in a region and $|f(z)|$ is constant there, then prove that f(z) is a constant function.

   (b) Define a residue of a function at a point. Obtain the residue of a function at a simple pole and a pole of order n.

7. (a) Evaluate $\int_0^{2\pi} \frac{d\theta}{4+\cos\theta}$ using complex integration.

   (b) Define a linear fractional (bilinear) transformation. State the condition for a mapping to be a valid bilinear transformation. Find the linear fractional transformation which maps the points $z = 0, 1, \infty$ onto $-1, 1, \infty$.

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