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1058

B.E. (Electronics and Communication Engineering)
Fourth Semester
MATHS-405: Linear Algebra and Complex Analysis

Time allowed: 3 Hours Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Section.

x-x-x

1. (A). Let V= R^3 and (i) $W=\{(a,b,c);a,b\in R\}$ then Show that W is a subspace of V.

   (ii) $W=\{(a,b,c);a+b+c=0\}$ then Show that W is a subspace of V.

   (iii) $W=\{(a,b,c);a\geq 0\}$ then Show that W is not a subspace of V. **(1+1)**

   (B). Determine whether or not the following vectors in R^3 are linearly dependent:

   $u=(1,-2,1);\quad v=(2,1,-1),\quad w=(7,-4,1)$ **(1)**

   (C). Show that similar matrices have the same eigen values. **(2)**

   (D) State Residue's Theorem. **(1)**

   (E). Define conformal and Isogonal mappings with examples. **(1+1)**

   (F). Show that the function $\frac{z^2-\bar{z}^2}{z\bar{z}}$ does not have a limit as z tends to 0. **(2)**

SECTION A

2. Let V be a finite dimensional vector space and $F:V\to U$ *be a linear transformation.* Then prove that

$$\dim V = rank(F)+Nullity(f)$$

(10)

3. *Let* $T:R^3\to R^3$ be the linear mapping defined by $T(x,y,z)=(x+2y-z,y+z,x+y-2z)$ Find a basis and the dimension of the (i) Image of U of T (ii) Kernel W of T. **(5+5)**

4. State and prove Cayley – Hamilton's Theorem. **(10)**

SECTION B

5. Find the bilinear transformation which maps the points $z_1=1,z_2=i,z_3=-1$ onto the points $w_1=i,w_2=0,w_3=-i$. For this transformation, find the image of (i) $|z|\leq 1$ (ii) Concentric circle $|z|>r\quad (r>1)$. **(6+2+2)**

6. (i) State necessary and sufficient conditions for a function *f(z)* of a complex variable to be analytic at appoint. **(2)**

   (ii) Evaluate $\oint_C \frac{z-1}{(z+1)^2(z-2)}dz$ where C is the circle : $|z-i|=2$ **(8)**

7. Expand the function $f(z)=\frac{1}{z(z^2-3z+2)}$ in Laurent series for the regions

   (a) $0<|z|<1$; (b) $1<|z|<2$; (c) $|z|>2$ **(4+4+2)**

x-x-x