Mid-West University

Examinations Management Office

End Semester Examinations 2081

Bachelor level/ B.E. Hydropower/ 3rd Semester

Time: 3 hours

Subject: Engineering mathematics III (SH431/SH201)

Full Marks: 50

Pass Marks: 25

- *Attempt all the questions*
- *Figures in the margin indicate full marks.*
- *Assume suitable values, with a stipulation, if necessary.*
- *Candidates are required to answer the questions in their own words as far as possible.*

1. a) i) Find the rank of the matrix $\begin{bmatrix} 3 & -1 & -2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$.

ii) Find the Fourier series to represent the function f(x)=$2-x^2$ $for\ -1 \le x \le 1$. **(2+3)**

b) i) Express the given matrix as the sum of a symmetric and skew-symmetric matrix.

$$\begin{bmatrix} 3 & -2 & 6 \\ 2 & 7 & -1 \\ 5 & 4 & 0 \end{bmatrix}.$$

ii) If $a+b+c=0$ then solve the equation $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$. **(2+3)**

2. a) i) Find the Laplace transform of the following function , $te^{-3t}cos2t$.

ii) Define the Laplace transform .Find the inverse Laplace transform of $\frac{2a^2}{(s^4-a^4)}$. **(2+3)**

b) Solve the following differential equation by Laplace transform method.

$y''' - y'' - 4y' + 4y = 0$, given that $y(0) = y'(0) = 0\ and\ y'' = 2$. **(5)**

3. a) i) Evaluate: $\oint_c \vec{F}.\vec{dr}$ where $\vec{F}$=$x^2y^2\vec{i}$ $+y\vec{j}$ and C is the curve $4x\,y^2\ from\ (0,0)\ to\ (4,4)$.

ii) Obtain the half-range cosine and sine series for $f(x) = x\ in\ the\ interval\ 9 \le x \le \pi$.

Hence show that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\cdots\ \ldots\ldots = \frac{\pi^2}{8}$. **(2+3)**

b) Find Eigen values and corresponding Eigen vectors of a square matrix A = $\begin{pmatrix} 2 & 1 & 2 \\ 0 & -1 & 3 \\ 0 & 1 & 1 \end{pmatrix}$. **(5)**

4. a) State and proved Green's theorem.

OR

Evaluate: $\oint_c\ [(x+y)dx + (2x-z)dy + (y+z)dz]$.Where C is the boundary of the triangle with vertices at (2,0,0) ,(0 ,3,0) and (0,0,6) ,by applying Stoke's theorem . **(5)**

b) Evaluate: $\iint_S \vec{F}.\vec{n}$ds , where $\vec{F}$=$(2xy+z)\vec{i}$+$y^2\vec{j}$-(x+3y)$\vec{k}$, where S is the surface bounded by the plane 2x+2y+z=6 , x=0, y=0, z=0, by using Gauss Divergence theorem. **(5)**

5. a) Evaluate: $\iiint_V \vec{F}$. dv, where V is the region bounded by $x=0,\ y=0, y=6,\ z=x^2\ and$ $z=4\ and\ \vec{F}=x\vec{i}+y\vec{j}+z\vec{k}$. **(5)**

b) Defined the line integral with example? Verify Stokes theorem for the function $\vec{F}$=$x^2-y^2)\vec{i}$+2x$y\vec{j}$, integral round the square in the plane z =0, and bounded by the line $x=0, y=0, x=a\ and\ y=b$. **(1+4)**

The End