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Total Number of Pages : 02

B.Tech  
FESM6302

5<sup>th</sup> Semester Back Examination 2018-19  
ADVANCE NUMERICAL METHODS  
BRANCH : CHEM, CIVIL, MECH, METTA, MME  
Time : 3 Hours  
Max Marks : 70  
Q.CODE : E477

Answer Question No.1 which is compulsory and any FIVE from the rest.  
The figures in the right hand margin indicate marks.

**Q1** Answer the following questions : (2 x 10)

- Define Discrete Fourier transform.
- What is Rayleigh Quotients?
- What is accelerating convergence?
- What is difference between interpolation and extrapolation?
- Write down the explicit formula to solve the heat equation
- Explain basic power method to find eigen values of a matrix.
- Explain the Shifted power method.
- Write the mathematical expression for Milne-explicit to solve ODE.
- What are the advantages of inverse power method over power method?
- Explain the Richardson's Extrapolation method.

**Q2** Find the Eigen values and Eigen vectors of the following matrix using power method (10)

$$\begin{bmatrix} 5 & -3 & 0 \\ -3 & 5 & -3 \\ 0 & -3 & 5 \end{bmatrix}$$

**Q3** Find QR factorization of the following matrix (10)

$$\begin{bmatrix} 5 & 3 & 3 \\ 3 & 5 & 3 \\ 3 & 3 & 5 \end{bmatrix}$$

**Q4** a) Find a natural cubic spline function interpolating the data (5)

<b>X</b>	-4	-2	0	2	4
<b>Y</b>	-4	-3	-2	-1	-1

b) Find the interpolation function for the data  $x=(0,1,2, 3)$  using FFT. (5)

**Q5** a) Find interpolating polynomial using piecewise cubic Hermite interpolation using the following data table (5)

<b>y</b>	-1	1	2
<b>f(y)</b>	-5	7	75
<b>f'(y)</b>	0	12	198

b) Find  $x(2)$  using Adams Predictor-corrector method for the following equation (5)

$$\frac{dx}{dy} = \frac{x+y}{5}; x(0)= 2, x(0.5)= 2.68, x(1)= 3.7, x(1.5)= 4.9$$

**Q6** Evaluate  $\int_0^4 \frac{dy}{y^2+10}$  using Romberg's method and determine the approximate value of  $\pi$ . **(10)**

**Q7** Find the smallest eigen value after 4 iteration steps using inverse power method. In addition, find out the eigen vectors **(10)**

$$\begin{bmatrix} 4 & 6 & 8 \\ 6 & 7 & 30 \\ 8 & 30 & 50 \end{bmatrix}$$

**Q8** Write short answer on any TWO : **(5 x 2)**

- a) Crank-Nicolson
- b) Finite-Element method
- c) Richardson's Extrapolation
- d) Interpolation