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Total Number of Pages: 02

**B.TECH**  
**FESM6302**

**5<sup>th</sup> Semester Regular / Back Examination 2015-16**  
**ADVANCE NUMERICAL METHODS**

**BRANCH: CIVIL,MECH,MM**

**Time: 3 Hours**

**Max Marks: 70**

**Q.CODE: T659**

**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)**

- a) What is the difference between Interpolation and Extrapolation?
- b) Write the piecewise interpolating polynomial for the following data
- |   |       |        |         |
|---|-------|--------|---------|
| X | 0     | 0.5    | 1       |
| Y | 1.000 | 0.5242 | -0.9037 |
- c) Find the value of  $f'(0.6)$  of the following data
- |   |       |       |       |
|---|-------|-------|-------|
| X | 0.5   | 0.6   | 0.7   |
| Y | 0.479 | 0.564 | 0.644 |
- d) What is the advantage of inverse power method over power method?
- e) Write down the difference formula for  $\frac{\partial u}{\partial x}$  in terms of difference quotients.
- f) What is Rayleigh Quotients?
- g) What is Fast Fourier Transform?
- h) Define elliptic, parabolic & hyperbolic type of partial differential equations?
- i) What is the difference between multistep method and predictor-corrector method?
- j) Explain the advantages of Implicit schemes over explicit schemes?

**Q2** a) Find a natural cubic spline function interpolating the data **(5)**

X	-1	0	1
Y	-3	-1	-1

b) Find the interpolating polynomial using piecewise cubic Hermite interpolation of the following data **(5)**

X	-1	1	2
f(x)	-5	7	76
f'(x)	0	12	198

**Q3** a) Find the 1<sup>st</sup> derivative and 2<sup>nd</sup> derivative of the function tabulated below at  $x=1$  &  $x=2$  **(5)**

X	1.0	1.2	1.4	1.6	1.8	2.0
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891

- b) Find the Eigen values of the matrix  $A = \begin{bmatrix} -2 & 2 & -1 \\ -2 & 2 & 0 \\ 2 & -2 & 3 \end{bmatrix}$  by QR method. (5)
- Q4 Evaluate  $\int_0^2 \frac{dx}{x^2+4}$  using Romberg's method. Hence obtain an approximate value of  $\pi$ . (10)
- Q5 Find the Eigen values and Eigen vectors of the following matrix by using power method (10)
- $$\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$
- Q6 Find  $y(2)$ , given  $\frac{dy}{dx} = \frac{x+y}{2}$ , with  $y(0)=2, y(0.5)=2.636, y(1)=3.595, y(1.5)=4.968$  using
- a) Adams Predictor –corrector method. (5)
- b) Milne-Simpsons predictor –corrector method. (5)
- Q7 Solve the Heat equation  $u_t = u_{xx}$  satisfying the condition  $u(0,t)=0, u(1,t)=1, t>0$  and  $u(x,0)=x^2$  for  $0<x<1$ . Compute  $u$  for two time steps using Crank-Nicolson formula by taking  $h=0.2$  and  $k=0.04$ . (10)
- Q8 Explain wave equation. Derive the iterative schemes for the solution of wave equation using (5 x 2)
- a) Explicit method
- b) Implicit method.