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Total Number of Pages : 02

B.Tech
FESM6302

5th Semester Back Examination 2019-20
ADVANCE NUMERICAL METHODS
BRANCH : CHEM, CIVIL, MECH, METTA, MME
Time : 3 Hours
Max Marks : 70
Q.CODE : HB380

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) State the difference between interpolation and extrapolation.
 - b) Write suitable method mathematically which will yield smallest Eigen value, if λ_1 is the largest Eigen value of the given matrix.
 - c) How many prior values are required to predict the next Value in Adam's method?
 - d) Determine $f'(2)$ for the given data:
- | | | | |
|------|---|---|----|
| x | 1 | 2 | 3 |
| f(x) | 3 | 7 | 10 |
- e) What is Rayleigh quotients?
 - f) Define parabolic, elliptic and hyperbolic type of partial differential equation.
 - g) What is multistep method?
 - h) What is accelerating convergence?
 - i) Write implicit formula to solve heat equation.
 - j) What is discrete Fourier transform?

Q2 a) Develop an interpolating polynomial by using piecewise Hermite interpolation for the given data: (5)

x	0	1	2
$f(x)$	1	3	35
$f'(x)$	1	6	81

- b) Formulate a natural cubic spline function which fits the given data: (5)**

x	-1	0	1
$f(x)$	-3	-1	-1

Q3 a) Calculate the smallest Eigen value by QR method for the matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$. (5)

- b) Calculate $y(0.8)$ and $y(1.0)$ by using Adam's predictor and corrector method. (5)**

Given that $\frac{dy}{dx} = \frac{x^2-y}{x+y^2}$,

x	0	0.2	0.4	0.6
$f(x)$	1.013	2.234	2.664	3.478

Q4 a) Determine $y(1.2)$ by using Milne's predictor-corrector method. (5)

Given that $\frac{dy}{dx} = x^2 - y^2$

x	0	0.3	0.6	0.9
y	1.132	1.736	1.954	2.316

b) Calculate $I = \int_0^2 \frac{x}{1+x^2} dx$ by using Romberg integration. (5)

Q5 a) Design interpolating function by using FFT for the data $z = < 0, 1, 2, 3 >$. (5)

b) Calculate $f'(1), f''(1), f'(2), f''(2)$ for the given data (5)

x	1	1.2	1.4	1.6	1.8	2
$f(x)$	1.8576	2.3471	2.6584	3.6855	4.6008	6.3284

Q6 Evaluate the Eigen values and Eigen vectors of the given matrix by using power method: (10)

$$\begin{bmatrix} -2 & 2 & -1 \\ -2 & 2 & 0 \\ 2 & -2 & 3 \end{bmatrix}.$$

Q7 Solve $u_t = u_{xx}$ by Crank-Nicolson method subjected to the condition $u(x, 0) = \sin \pi x$ and boundary condition $u(0, t) = 0$ and $u(1, t) = 1$ where $0 < x < 1$ and $0 \leq t \leq 0.5$ by taking $h = 0.25$, $k = 0.25$. (10)

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

- a)** Mixed-Radix FFT.
- b)** Explicit method and implicit method.
- c)** Richardson's Extrapolation.