

**Registration No :**

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**Total number of pages : 02**

**B.Tech.  
FESM6302**

**6<sup>th</sup> Semester Back Examination 2017-18**

**ADVANCE NUMERICAL METHODS**

**BRANCH : CHEM**

**Time : 3 Hours**

**Max Marks : 70**

**Q.CODE : C479**

**Answer Question No. 1 which is compulsory and any FIVE from the rest.**

**The figures in the right-hand margin indicate marks.**

**Assume suitable notations and any missing data wherever necessary.**

**Answer all parts of a question at a place.**

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

- (a) What is the central difference formula to find  $f^{iii}(x)$ ,  $f^iv(x)$ .
- (b) Explain piecewise interpolation.
- (c) Find the value of  $f^{ii}(0.5)$  of the following data

x	0.3	0.5	0.7	0.9
F(x)	0.15	0.185	0.267	0.314

- (d) Explain Romberg integration.
- (e) Define Rayleigh Quotient.
- (f) What is shifted power method?
- (g) What is discrete Fourier transform?
- (h) Write Adams-bash forth predictor–corrector formula.
- (i) Check the nature of the equation  

$$2U_{xx} + 5U_{xy} - 3U_{yy} + 4U_x + 5 = 0$$
- (j) Explain about standard five point formula with an example.

**Q2. Using the following data, estimate the value of  $f(-0.5)$  &  $f(0.5)$  by piece wise cubic Hermite Interpolation. (10)**

x	f(x)	$f'(x)$
-1	1	-5
0	1	1
1	3	7

**Q3. From the following table evaluate  $f'(3)$  by Richardson's method. (10)**

x	1	2	3	4	5	7
f(x)	1	16	81	256	625	2401

**Q4. (a) Use the QR method to calculate the Eigen values of (5)**

$$A = \begin{pmatrix} 5 & -2 \\ -2 & 8 \end{pmatrix}$$

- (b) Find the smallest Eigen value of  $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$  by inverse power method. (5)

**Q5.** (a) Using Milne's predictor corrector method find  $y(0.8)$ . (5)

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

X	0	0.2	0.4	0.6
Y	1	1.12186	1.4282	1.7379

- (b) Using Adam's predictor corrector method determine  $y(0.4)$  and  $y(0.5)$ . Correct to 3 decimals given that  $\frac{dy}{dx} = 0.5xy$  (5)

X	0	0.1	0.2	0.3
Y	1	1.0025	1.0101	1.0228

**Q6.** Using Crank-Nicholson's scheme, solve  $u_{xx} = 16u_t$ . (10)

Where  $0 < x < 1$ ,  $t > 0$ .

Given  $u(x,0)=0$ ,  $u(0,t)=0$ ,  $u(1,t)=100t$ .

Compute  $u$  for two time steps in  $t$  direction taking  $h=1/4$ .

**Q7.** Solve  $U_{xx} = U_t$  by Bender-Schmidt formula. (10)

Subject to  $U(x,0)=\sin \pi x$ , where  $0 < x < 1$

$$U(0,t)=0$$

$$U(1,t)=t$$

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

- (a) Mixed-radix FFT
- (b) Basic QR method
- (c) Romberg Integration
- (d) Fast Fourier Transform