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Total Number of Pages: 02

B.Tech
FESM6301

6th Semester Regular / Back Examination 2016-17

NUMERICAL METHODS

BRANCH(S):ECE,ETC

Time: 3 Hours

Max Marks: 70

Q.CODE: Z249

**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) Convert the binary form $(1100010.101)_2$ to decimal fraction .Then round off to two significant digits and calculate the relative error.
 - b) State Intermediate value Theorem
 - c) How many steps required to approximate a root in the interval $(0,1)$ of the equation $x^2+x-1=0$ which is correct upto 3 decimal places by bisection method.
 - d) What is the iteration formula to find the root of the equation $x^4-x-8=0$ in the interval $[1,2]$ by fixed point method.
 - e) When a system of equations is said to be ill conditioned?
 - f) Find the interpolating polynomial for the data point $((1,0),(0,-1)$ and $(-1,2)$.
 - g) Find the divided difference table corresponding to the data points $(2,5),(4,9),(5,7),(10,22)$.
 - h) Find the maximum step size so that the integration of $f(x)=\sin x$ in the interval $[0,\pi/2]$,is correct to 3 decimal places.
 - i) State 4th order Runge-Kutta method to solve a first order differential equation with initial conditions.
 - j) What are the uses of eigen values in engineering?
- Q2 a) Define the secant Method to find root of an equation. (2)**
b) Find the root of the equation $x-0.2\sin x=0.5$,lying between $(0.5,1)$ and correct to 4 decimal places using secant method. (8)
- Q3 a) The observed values of a function are respectively 168,120,72,63 at the four positions 3,7,9 and 10 of the independent variable. What is the best estimate you can give for the value of the function at the position 6 of the independent variable? (5)**
b) Find the population of India for the year 1926 with the help of the following data. (5)

Year (x)	1911	1921	1931	1941
Population in crores	30.3	30.5	33.8	38.9

Q4 a) Evaluate $\int_0^1 e^{-x^2} dx$ by Simpson's 1/3rd rule. **(5)**

b) Compute the integral $\int_5^{12} (1/x) dx$ by applying Gauss's 3 point quadrature formula. Also find error. **(5)**

Q5 a) Using modified Euler's method, obtain a solution of the equation **(5)**

$\frac{dy}{dx} = x + \sqrt{y}$, with initial condition $y(0)=1$ for the range $0 \leq x \leq 0.6$ in steps of 0.2.

b) Use Runge-Kutta method of 4th order to obtain the numerical solution $y(0.2)$ correct to four decimal places of the IVP $y' = x^2 + y^2$, $y(0)=1$, with step size 0.1 **(5)**

Q6 a) Solve the following system of equations using Gauss Seidel Iterative method correct up to two decimal places. **(5)**

$$27x + 6y - z = 85$$

$$6x + 15y + 2z = 72$$

$$X + y + 54z = 110$$

b) Find the largest Eigen value of the matrix A given below using power method. **(5)**

$$\begin{pmatrix} -15 & 4 & 3 \\ 10 & -12 & 6 \\ 20 & -4 & 2 \end{pmatrix}$$

Q7 Find the natural cubic spline that interpolates the points $(1,1), (2,1/2), (3,1/3)$ and $(4,1/4)$ **(10)**

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

- Write short note on Error Propagation.
- Write short note on order of convergence of an equation $f(x)=0$
- Write short note on Interpolation.
- Write short note on single step method and Multi step method. For IVP.