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Numerical Analysis & Computational Methods
(1030)

P. Pages : 2

Time : Three Hours **Max. Marks : 100**

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory and attempt **any two** bits out of a, b, c from each question.
5. Use of non programmable calculator is allowed.
. Assume suitable data, if necessary.

UNIT – I

1. a) i) Explain error in computations. **5**

ii) Describe the concept of mathematical modelling of engineering problem. **5**

b) Use the method of bisection, find a real root of the equation $x^4 + 2x^3 - x - 1 = 0$ in the interval (0, 1) correct to three decimal place. **10**

c) Find the root of $x^3 - 3x^2 + 2.5 = 0$ whose root lies between 2 and 3 by Horner's method. **10**

UNIT – II

2. a) Evaluate $\int_0^{\pi} \frac{\sin^2\theta}{5 + 4\cos\theta}$ dQ by Simpson's 3/8th role taking $h = \frac{\pi}{\sigma}$. **10**

b) Using modified Euler method, get y(0.2), y(0.4) y(0.6) given $\frac{dy}{dx} = y - x^2$, $y(0) = 1$. **10**

c) Apply Runge-Kutta method, find approximation value of y for x=0.2 in step size of 0.1 if $\frac{dy}{dx} = x + y^2$ give that y=1 when x=0. **10**

UNIT – III

3. a) State Newton forward and Backward Interpolation formula. From the following table find f(x) and hence f(σ) using Newton's interpolation formula. **10**

x	1	2	7	8
f(x)	1	5	5	4

b) Using stirling formula find tan 16° given. **10**

θ	0^o	5^o	10^o	15^o	20^o	25^o	30^o
tanθ	0.00	0.875	0.1763	0.2679	0.3640	0.4663	0.5774

c) Fit the curve of the form $y=ax^b$ for the following. **10**

x	1	2	3	4	5	6
y	1200	900	600	200	110	50

And state the application of curve fitting in Engineering.

UNIT – IV

4. a) Solve the system of equation by Gauss-Elimination method. **10**

$$4.12x - 9.68y + 2.01z = 4.93$$
$$1.88x - 4.62y + 5.50z = 3.11$$
$$1.10x - 0.96y + 2.72z = 4.02$$

b) Explain Cholesky's method. State the comparison between Direct method and Iterative method. **10**

c) Solve the system of equations by Gauss-Seidel method. **10**

$$5x - 2y + z = -4$$
$$x + 6y - 2z = -1$$
$$3x + y + 5z = 13$$

UNIT – V

5. a) Explain the difference between finite difference method and finite element method. Write basic steps of finite element analysis. **10**

b) Explain Bender-Schmidt method. **10**

Solve $\frac{\partial^2 u}{\partial x^2} - 2\frac{\partial u}{\partial t} = 0$ given u(o, t) = 0, u(u, t) = 0, u(x, o) = x(4-x).

Assume h=1 find the values of u upto t=5.

c) Derive the formula for Crank-Nicholson's method. Using Crank-Nicholson's scheme, solve **10**

$u_{xx} = 16\mu_t \quad 0 < x < 1 \quad t > 0$ given

$\mu(x,0) = 0 \quad \mu(0,t) = 0 \quad \mu(1,t) = 100t$

Compute μ for one step in t direction taking $h = \frac{1}{4}$.

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