

[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2064)

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B. Tech 4th Semester Examination
Computer Based Numerical Analysis (O.S.)
AS/ME-4004

Time : 3 Hours

Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions selecting one from each section.
Section E is compulsory.

SECTION - A

1. (a) From the following table estimate the number of students who obtained marks between 75 and 80. (10)

Marks	30-40	40-50	50-60	60-70	70-80
No of students	31	42	51	35	31

- (b) Using Stirling formula find $y(12.2)$ (10)

x°	10	11	12	13	14
$10^5 y(x)$	23967	28060	31788	35209	38368

2. (a) Find the expression for velocity in terms of time from following data:

time 't'	0	1	3	4
velocity 'v'	21	15	12	10

Hence find acceleration at $t = 4$ and distance moved in 4 seconds. (10)

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[P.T.O.]

- (b) Define (i) forward (ii) backward difference operator. Hence prove that

$$hD = \log(1 + \Delta) = -\log(1 - \nabla) = \sinh^{-1}(\mu\delta)$$

where symbols have usual meaning. (10)

SECTION - B

3. (a) Prove that Bisection method is always convergent. (10)
 (b) Solve the system of equations $10x - 2y - 3z = 205$, $-2x - y + 10z = 120$ and $-2x + 10y - 2z = 15$ using relaxation method. (10)
4. (a) Derive iteration formula of Newton Raphson method & hence show that it has quadratic rate of convergence. (10)
 (b) Solve $\cos x = 3x - 1$ correct to three decimal places using iteration method. (10)

SECTION - C

5. (a) Find the value of $f'(x)$ at $x = 3.5$ from data given below:

x	1.5	2.0	2.5	3.0	3.5	4.0
f(x)	3.375	7.0	13.625	24.0	38.875	58.0

(10)

- (b) Find value of $\int_0^1 \frac{dx}{1+x^2}$ with 12 strips using Simpson's $\frac{3}{8}$ rule. (10)

6. (a) Find the value of $\int_0^1 \frac{dx}{1+x}$ using trapezoidal Rule with $h = \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}$ then by Romberg method. (10)

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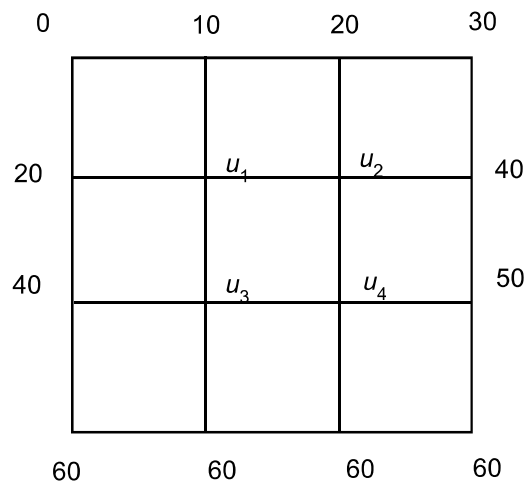
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- (b) Using Newton interpolation formula prove that

$$D = \frac{1}{h} \log(1 + \Delta) = -\frac{1}{h} \log(1 - \nabla) \quad (10)$$

SECTION - D

7. (a) Find the solution of $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ correct to 2 decimal places over grid below: (10)



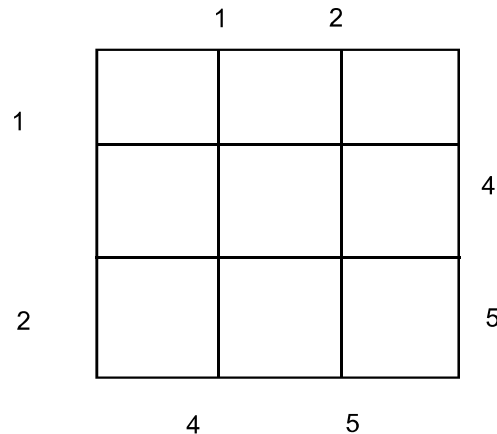
- (b) Find the finite difference equation corresponding to parabolic equation by Schmidt method. (10)
8. (a) Use Crank Nicolson's method to solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ for two step in time
- $u(x, 0) = 0$ $u(0, t) = 0$ and $u(l, t) = 200t$ (10)

[P.T.O.]

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- (b) Find the solution of $u_{xx} + u_{yy} = 0$ over square mesh with boundary values as shown (10)



SECTION - E

9. Each part carries 2 marks:

- State convergence condition of iteration method to solve non-linear equations.
- State the convergence condition of Gauss Seidal method.
- Prove that $e^{hD} = E = 1 + \Delta$
- State Stirling interpolation formula and its applications.
- Find the expression for $\frac{dy}{dx}$ using Newton's forward difference interpolation formula.
- Find the value of $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule using 5 strips.
- Find the finite difference equation corresponding to Laplace equation.
- Explain complete pivoting
- Find the root of $x \log_{10} x = 1.2$ between 2 and 3 if exists.
- Prove that Divided Differences are symmetric.