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337312(37)

B. E. (Third Semester) Examination, 2020

APR-MAY

(Old Scheme)

(Mech. Engg. Branch)

NUMERICAL ANALYSIS & COMPUTER PROG. (C & C++)

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) of each question is compulsory having 2 marks and solve any two parts from remaining part (b), (c) and (d) of each question having 7 marks each.*

1. (a) What is meant by errors. Write about round of errors. 2

(b) Find a root of the equation $x^3 - 4x - 9 = 0$, using

the Bisection method correct to three decimal places. 7

(c) Find the positive root of $x^4 - z = 10$ correct to three decimal places, using Newton's-Raphson method. 7

(d) Solve : 7

$$10x - 7y + 3z + 5u = 6$$
$$-6x + 8y - z - 4u = 5$$
$$3x + y + 4z + 11u = 2$$
$$5x - 9y - 2z + 4u = 7$$

by Gauss elimination method.

2. (a) Show that $\Delta = E - 1$, where the notation has its usual meaning. 2

(b) R is the resistance to motion of a train at speed V; kind a law of the type $R = a + bV^2$ connecting R and V, using the following data : 7

V (km/hr)	: 10	20	30	40	50
R (kg/ton)	: 8	10	15	21	30

(c) From the following table, estimate the number of studetns who obtained marks between 40 and 45 : 7

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

(d) The following data gives the velocity of a particle bar 20 seconds at an internal of 5 seconds. Find the initial acceleration using the entire data : 7

Time t (sec)	:	0	5	10	15	20
velocity V (m/sec)	:	0	3	14	69	228

3. (a) Write trapezoidal rule. 2

(b) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using : 7

(i) trapezoidal rule

(ii) Simpson's 1/3 rule

(iii) Simpson's 3/8 rule.

(c) Solve the following by Euler's modified method : 7

$$\frac{dy}{dx} = \log(x + y), \; y(0) = 2$$

at $x = 1 \cdot 2$ and $1 \cdot 4$ with $h = 0 \cdot 2$.

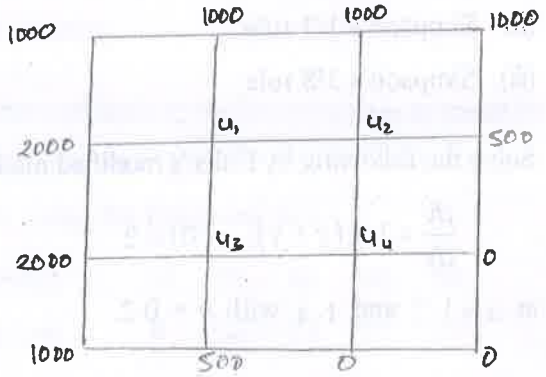
(d) Using Runge-Kutta method of fourth order, solve

$$\frac{dy}{dx}=\frac{y^2-x^2}{y^2+x^2} \text{ with } y(0)=1 \text{ at } y=0\cdot2,\ 0\cdot4. \quad 7$$

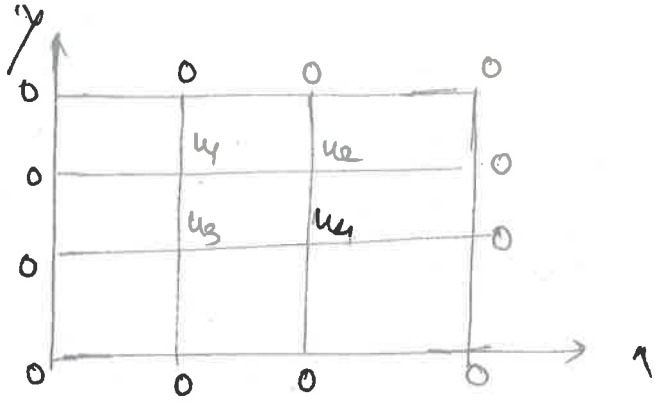
4. (a) Classify the following equation : 2

$$\frac{\partial^2 u}{\partial x^2}+4\frac{\partial^2 u}{\partial x\partial y}+4\frac{\partial^2 u}{\partial y^2}-\frac{\partial u}{\partial x}+2\frac{\partial u}{\partial y}=0$$

(b) Given the values of $u(x, y)$ on the boundary of the square in fig, evaluate the function $u(x, y)$ satisfying the Laplace equation $\nabla^2 u=0$ at the pivotal points of this fig. by Gauss-Seidal method. 7



(c) Solve the equation $\nabla^2 u=-10\left(x^2+y^2+10\right)$ over the square with sides $x=0=y,\ x=3=y$ with $u=0$ on the boundary and mesh length $h=1$. 7



(d) Solve $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial^2 x^2}$ in $0<x<5,\ t\geq 0$ given that

$u(x, 0)=20,\quad u(0, t)=0,\quad u(5, t)=100.$

Compute u for the time step with $h=1$ by Crank Nicholson method. 7

5. (a) What is meant by Input/output statement. 2

(b) What are the different types of operators used. 7

(c) Write a short note on arrays. 7

(d) Write a programme to kind out the factorial of a given number. 7