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337455(37)

B. E. (Fourth Semester) Examination, April-May 2020

(New Scheme)

(Mech. & Production Branch)

NUMERICAL ANALYSIS & COMPUTER PROGRAMMING (C & C++)

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

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

Unit-I

1. (a) Round off the numbers 865250 and 37.46235 to four significant figures and compute E_a, E_r, E_p in each case. 2

(b) Explain Newton Raphson method for finding roots of an equation. Find by Newton's iterative method, the real root of the equation $3x = \cos x + 1$. 7

(c) Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position connect to three decimal places. 7

(d) Apply Gauss elimination method to solve the equations $x + 4y - z = -5$; $x + y - 6z = -12$; $3x - y - z = 4$. 7

Unit-II

2. (a) Reduce the pattern $y = ae^{bx}$, where a and b are constant, into a linear law of the form $y = mx + c$. 2

(b) R is the resistant to motion of a train at speed V; find 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 students 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) Interpolate by means of Gauss's backward formula, the population of a town for the year 1974, given that : 7

Year	:	1939	1949	1959	1969	1979	1989
Population (in thousands)	:	12	15	20	27	39	52

Unit-III

3. (a) Write the Trapezoidal formula for numerical integration. 2

(b) Given that :

x	:	1·0	1·1	1·2	1·3	1·4	1·5	1·6
y	:	7·989	8·403	8·781	9·129	9·451	9·750	10·031

Find $\frac{dy}{dx}$ at $x = 1{\cdot}1$. 7

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(c) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using (i) Trapezoidal rule;

(ii) Simpson 1/3 rule. 7

(d) Apply Runge-Kutta method to find approximate value of y for $x = 0{\cdot}2$, in steps of $0{\cdot}1$, if $\frac{dy}{dx} = x + y^2$, given that $y = 1$ where $x = 0$. 7

Unit-IV

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) Solve by relaxation method, the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, inside the square bounded by the lines $x = 0$, $x = 4$, $y = 0$, $y = 4$, given that $u = x^2 y^2$ on the boundary. 7

(c) Find the values of $u(x, t)$ satisfying the parabolic equation $\frac{\partial u}{\partial t} = 4\frac{\partial^2 u}{\partial x^2}$ and the boundary conditions

$u(0, t) = 0 = u(8, t)$ and $u(x, 0) = 4x - \frac{1}{2}x^2$ at

the points

$x = i$; $i = 0, 1, 2, ...7$ and

$t = \frac{1}{8} j$; $j = 0, 1, 2, ...5$. 7

(d) Evaluate the pivatal values of the equation $u_{tt} = 16\, u_{xx}$ taking $\Delta x = 1$ upto $t = 1{\cdot}25$. The boundary conditions are $u(0, t) = u(5, t) = 0$, $u_t(x, 0) = 0$ and $u(x, 0) = x^2(5 - x)$. 7

Unit-V

5. (a) Define 'Array'. 2

(b) Explain decision making and loop statements used in 'C' programming. 7

(c) List various arithmatic, relational and logical operators in 'C'. 7

(d) Write a 'C' programme to generate a series 1, 8, 27, 64, ... upto ten terms. 7