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337455(37)

B. E. (Fourth Semester) Examination, 2020

APR-MAY 2022

(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) Define E_a, E_r, E_p. 2

(b) Using the bisection method, find an approximate root of the equation $\sin x = 1/x$, that lies between $x = 1$ and $x = 1{\cdot}5$ (measured in radians). Carry out computations upto 7th stage. 7

(c) Using Newton's iterative method, find the real root of $x \log_{10} x = 1{\cdot}2$ correct to five 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) What is Emperical Law? 2

(b) An experiment gave the following values :

V (ft/min)	:	350	400	500	600
t (min)	:	61	26	7	2·6

It is known that V and t are connected by the relation $V = at^b$. Find the best possible values of a and b. 7

(c) Evaluate :

$$\Delta^2 \left[\frac{5x+12}{x^2+5x+16} \right]$$

7

(d) Use Guass's forward formula to evaluate y_{30}, given that $y_{21} = 18{\cdot}4708$, $y_{25} = 17{\cdot}8144$, $y_{29} = 17{\cdot}1070$, $y_{33} = 16{\cdot}3432$ and $y_{37} = 15{\cdot}5154$. 7

Unit-III

3. (a) Write formula for Simpson's $\frac{1}{3}$ & $\frac{3}{8}$ rule. 2

(b) Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with initial condition $y = 1$ at $x = 0$; find y for $x = 0{\cdot}1$ by Euler's method. 7

(c) Evaluate the integral $\int_0^1 \frac{x^2}{1+x^3}\,dx$ using Simpson's 1/3rd rule. Compare the error with the exact value. 7

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(d) Apply Milne's method, to find a solution of the differential equation $y' = x - y$ in the range $0 \le x \le 1$ for the boundary condition $y = 0$ at $x = 0$. 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) Solve $y_{tt} = y_{xx}$ upto $t = 0{\cdot}5$ with a spacing of 0·1 subject to $y(0, t) = 0$; $y(1, t) = 0$; $y_t(x, 0) = 0$ and $y(x, 0) = 10 + x(1 - x)$. 7

Unit-V

5. (a) Explain input/output function with example. 2

(b) Differentiate between : 7

(i) While and do-while loop

(ii) Break and continue

(c) Write a 'C' program to check whether an entered year is leap year or not. 7

(d) Write a 'C++' program which prints all odd positive integers less than 100, omitting those integers divisible by 7. 7