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BE (3rd Semester)

Examination, April-May 2021

Branch : Mechanical

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

Time Allowed : Three Hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : (i) Part (a) of each question is compulsory.

(ii) Attempt for 14 marks for remaining portion

for each question of each unit.

UNIT-I

Q. 1. (a) Round off the number 8.8975 upto three decimal places. Also mention the rules followed to solve the problem. **2**

(b) If $R = 4xy^2/z^3$ & errors in x, y and z be 0.001. Show that the maximum relative error at x = y = z = 1 is 0.006. **7**

(c) Find the negative root of equation $x^3 - 21x + 3500 = 0$ correct to two decimal places by Newton-Raphson method. **7**

(d) Solve the following equations by Gauss-elimination method, using pivoting technique : 7

$2x + y + z = 10$; $3x + 2y + 3z = 18$ and

$x + 4y + 9z = 16$.

UNIT-II

Q. 2. (a) Reduce the law $y = ax^n + b \log x$ to linear law

$Y = aX + b$. 2

(b) Fit a straight line to the following data : 7

Year (x)	1951	1961	1971	1981	1991
Production (y)	8	10	12	10	16

using least square method find expected production in year 1996.

(c) Find the values of 'a', 'b' & 'c' to fit a parabola $y = a + bx + cx^2$ to the following data : 7

x	20	40	60	80	100	120
y	5.5	9.1	14.9	22.8	33.3	46.0

(d) From the following data, estimate the number of employees of a company having income between 2000 & 2500. 7

Income	Below 500	500–1000	1000–2000	2000–3000	3000–4000
No. of Employees	6000	4250	3600	1500	650

UNIT-III

Q. 3. (a) Find an approximate solution for y(0.1) from

$\frac{dy}{dx} = x^2y - 1$; if y(0) = 1 using Tayor series. **2**

(b) Evaluate $\int_0^5 \frac{dx}{4x+5}$, taking 11 ordinates, using Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule. Also find an approximate value of $\log_e 5$. **7**

(c) Solve following by "Modified Euler's Method" at x = 0.6, take interval between x as 0.2. **7**

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

(d) Using Runge-Kutta method of fourth order; solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with y(0) = 1 at x = 0.2. **7**

UNIT-IV

Q. 4. (a) Write the conditions for a partial differential equation if it is (i) Elliptic (ii) Hyperbolic. **2**

(b) Solve $4_{xx} + 4_{yy} = 0$ over the square mesh of side 4 units, satisfying the following conditions : **7**

(i) $u(0, y) = 0$, for $0 \leq y \leq 4$

(ii) $u(4, y) = 12 + y$, for $0 \leq y \leq 4$

(iii) $u(x, 0) = 3x$, for $0 \leq x \leq 4$

(iv) $u(x, 4) = x^2$ for $0 \leq x \leq 4$ answer using 1 iteration only.

(c) Solve $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square mesh with sides $x = 0$, $x = 3$ & $0 \le y \le 3$ with $u = 0$ on all boundaries 4 mesh length 1 unit. Use Gauss elimination method for final solution. 7

(d) Solve $\frac{\partial^2 u}{\partial x^2} - 2\frac{\partial u}{\partial t} = 0$ for $u(0, t) = u(4, t) = 0$ & $u(x, 0) = x(4 - x)$. Assume $h = 1$ find u for t 0 to 5. Using average formula of Schmidt. 7

UNIT-V

Q. 5. (a) Define c-standard libraries. 2

(b) What are operators chart & discuss various types of operators offered by C/C++ language. 7

(c) Define & differentiate one-D & 2-D array. 7

(d) Write a program to find a number is odd or even. 7
