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# 337455(37)

## B. E. (Fourth Semester) Examination,

## Nov.-Dec. 2021

## (New Scheme)

## (Mech. & Production Branch)

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

*Time Allowed : Three hours*

*Maximum Marks : 80*

*Minimum Pass Marks : 28*

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

### Unit-I

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

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

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

(d) Apply Gauss Elimination method to solve the equation

$x + 4y - z = -5$; $x + y - 6z = -12$; $3x - y - z = 4$.

## Unit-II

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

(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 :

| | | | | | |
|---|---|---|---|---|---|
| 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.

| | | | | | |
|---|---|---|---|---|---|
| Marks | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 |
| No. of Students | 31 | 42 | 51 | 35 | 31 |

(d) Interplate by means of Gauss's backward formula, the population of a town for the year 1974, given that :

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

## Unit-III

3. (a) Write the Trapezoidal formula four numerical integration.

(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 $x = 1 \cdot 1$.

(c) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using (i) Trapezoidal rule (ii) Simpson 1/3 rule.

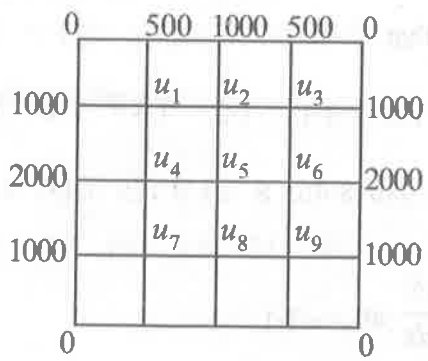
(d) Apply Runge-Kutta method to find approximate value of $y$ for $x = 0.2$, in steps of 0.1, if $dy/dx = x + y^2$, given that $y = 1$ where $x = 0$.

## Unit-IV

4. (a) Classify the following equation

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

(b) Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following sequence mesh with boundary values as shown :








(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 point

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

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

(d) Evaluate the pivatal values of the equation $u_{tt} = 16u_{xx}$ taking $\Delta x = 1$ upto $t = 1.25$. The boundary conditions are :

$u(0,t) = u(5,t) = 0$, $u_t(x,0) = 0$ and

$u(x,0) = x^2(5-x)$

## Unit-V

5. (a) Define 'array'.

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

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

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