BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE)
B.Tech.Sem - IV MECHANICAL :SUMMER- 2022
SUBJECT : NUMERICAL METHODS & OPTIMIZATION TECHNIQUES

Day : Friday

Date : 24-06-2022 **S-12739-2022**

Time : 10:00 AM-01:00 PM

Max. Marks : 60

N. B. :
1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Draw neat and labelled diagrams **WHEREVER** necessary.
4) Assume suitable data, if necessary.

Q. 1   **a)**   Find a positive real root of $x - \cos x = 0$ by bisection method between **(05)** 0 and 1.

      b)   Find the real root of the equation $x = e^{-x}$ using Newton's **(05)**

OR

Q. 1   The velocity of a falling parachutist is given by: **(10)**

$$v = \frac{gm}{c} \left(1 - e^{-(c/m)t}\right)$$

Where $g = 9.81 \ m/s^2$. For a parachutist with a drag co-efficient $c = 14 \ kg/s$, compute m so that the velocity is $v = 35 \ m/s$ at $t = 8s$.

Q. 2   Solve the Gauss Elimination method: **(10)**

$$2x + 3y - z = 5$$
$$4x + 4y - 3z = 3$$
$$2x - 3y + 2z = 2$$

OR

Q. 2   Solve the following by Gauss Seidel method: **(10)**

$$1.2x + 2.1y + 4.2z = 9.9$$
$$5.3x + 6.1y + 4.7z = 21.6$$
$$9.2x + 8.3y + 2z = 15.2$$

Q. 3   Use the method of least squares to fit the curve $y = \dfrac{c_0}{x} + c_1 \sqrt{x}$ to the **(10)** following data:

x	0.1	0.2	0.4	0.5	1	2
y	21	11	7	6	5	6

OR

Q. 3   The table below gives value of tan x for $0.1 \leq x \leq 0.3$ **(10)**

x	0.1	0.19	0.20	0.25	0.3
tan x	0.1003	0.1511	0.2027	0.2553	0.3093

Find value of tan 0.12 and tan 0.28 by Newton's interpolation.

P. T. O.

Q. 4   Find value gradient of the road at $x = 1805$ and $x = 05$ from the elevation   **(10)**
data given below:

x	0	300	600	900	1200	1500	1800
y	135	149	157	183	201	205	193

OR

Q. 4   **a)**   Write the algorithm for Simpson's $1/3^{rd}$ rule for integration.   **(05)**

b)   Write the mat lab program for Trapezoidal rule.   **(05)**

Q. 5   Minimize $f(x) = e^{-x} - \cos x$ $\in [0, 1]$ by Golden section search method.   **(10)**

OR

Q. 5   How do you find the extrema of a function by classical methods?   **(10)**

Q. 6   What are the optimality criteria for optimization of a multivariable function?   **(10)**

OR

Q. 6   What is a linear programming problem?   **(10)**

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