B.Tech. SEM -IV Mechanical 2014 Course (CBCS) : SUMMER - 2019

SUBJECT: NUMERICAL METHODS AND OPTIMIZATION TECHNIQUES

Day: Saturday
Date: 01/06/2019

Time: 10.00 AM TO 01.00 PM
Max. Marks: 60

S-2019-2626

N.B:

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Assume suitable data if necessary.
4) Use of non- programmable **CALCULATOR** is allowed.

Q.1 The displacement equation of a structure is defined by the following equation for damped oscillation **(10)**

$$y = 9e^{-kt}cos\omega t$$

Where k=0.7 and ω=4
Use Newton's method to determine time t.

OR

Q.1 Find the value of $(27)^{3/4}$ by bisection method. **(10)**

Q.2 Solve the following system of equations by Gauss Jordan Method. **(10)**

$$2x + 2y + z = 6$$
$$4x + 2y + 3z = 4$$
$$x - y + z = 0$$

OR

Q.2 Solve the following set of equations by Gauss Jacobi method. **(10)**

$$10x - 2y - z - w = 3$$
$$-2x + 10y - z - w = 15$$
$$-x - y - 2z + 10w = -9$$
$$-x - y - 10z - 2w = 27$$

Q.3 The pressure of a gas corresponding to various volumes v is measured, given by the following data. **(10)**

v(cm^3)	50	60	70	90	100
P(kg/cm^3)	64.7	51.3	40.5	25.9	78

Fit the data to the equation $Pv^{\gamma} = C$.

OR

Q.3 Find the number of students getting marks 10 to 15 from the following data **(10)**

Marks	0-10	10-20	20-30	30-40
Frequency	9	30	35	42

P.T.O.

Q.4 The normal distribution is defined as **(10)**

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}$$

Use Simpson's 1/3 and 3/8 rule to integrate this function from x=-1 to 1.

OR

Q.4 Find y(0.2) if $\frac{dy}{dx} = \log(x + y)\,; y(0) = 1$ using Euler's method taking h=0.05. **(10)**

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

OR

Q.5 Minimize the function $2x^2 - 4x$ in the range[-1,2] by golden section search method till $\in = 0.1$ **(10)**

Q.6 How do you generate a Hessian Matrix in optimization of a multivariable function? **(10)**

OR

Q.6 Find the extreme points of the function **(10)**

$$f(x, y) = x^3 + y^3 + 2x^3 + 4y^2 + 6$$

By classical optimization technique.

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