Date: 13/05/2019.

Student Exam No._____

GANPAT UNIVERSITY

M. Tech. Semester: II (AMS/CAD-CAM) Mechanical Engineering

CBCS Regular Examination Apr-June 2017

3ME202 Engineering Optimization

Time: 3 Hours **Total Marks: 60**

Instruction:
1. This Question paper has two sections.
2. Attempt each section in separate answer book.
3. Figures on right indicate marks.
4. Be precise and to the point in answering the descriptive questions.

Section - I

Que. 1

(a) Discuss local optimum, global optimum and inflection point. **(06)**

(b) Determine max and min value of the function **(04)**

$$f(x) = 12x^5 - 45x^4 + 40x^3 + 5$$

OR

Que. 1

(a) Write necessary and sufficient condition for one dimensional optimization problem. **(05)**

(b) Show that xe^{-x} has the maximum value at $x = 1$. **(05)**

Que. 2

(a) Explain Taylor series **(05)**

(b) By Lagrange multiplier method **(05)**

$$\text{Maximize } Z = \pi x_1^2 x_2$$

$$\text{Subjected to } x_1^2 + x_1 x_2 - 12 = 0.$$

OR

Que. 2

(a) Write working procedure to solve optimization problem using Kuhn-Tucker Condition method. **(05)**

(b) What are Convex and Concave Function? **(05)**

Que. 3 Do as directed

(a) Find the Hassian matrix for following function **(03)**

$$f(x_1, x_2) = x_1^3 + 3x_1 x_2^2 - 15x_1^2 - 15x_2^2 + 72$$

(b) Find the stationary point of the function **(03)**

$$f(x, y) = 3x^2 + y^2 + 12x - 6xy$$

(c) Use constrained variation method to maximize the volume of an open cone when the surface area of the cone is 20π **(04)**

Section – II

Que. 4

(a) Show how to solve optimization problem using Fibonacci method? **(05)**

(b) Find the minimum of the function by using golden section methods in the interval (0, 5) **(05)**

$$f(x) = x^5 + 5x^3 - 20x + 5$$

OR

Que. 4 Find the minimum of $f(x) = x(x - 1.5)$. By Interval Halving Method in the interval (0.0, 1.0) to within 10% of the exact value. **(10)**

Que. 5

(a) Compare the ration of intervals of uncertainty $\frac{L_n}{L_0}$ obtainable in the following methods for n = 2, 3, …. , 10. **(05)**

1. Exhaustive search
2. Dichotomous search with $\delta = 10^{-4}$
3. Interval halving method

(b) Find the number of experiments to be conducted in the following methods to obtain a value of $\frac{L_n}{L_0} = 0.001$. **(05)**

1. Exhaustive search
2. Dichotomous search with $\delta = 10^{-4}$
3. Interval halving method

OR

Que. 5 Find the minimum of the function **(10)**

$$f(x) = 0.65 - \frac{0.75}{1 + x^2} - 0.65 \, x \tan^{-1}\left(\frac{1}{x}\right)$$

By exhaustive search in the interval (0, 3) to achieve an accuracy of within 5% of the exact value.

Que. 6 Do as directed.

(a) Discuss Quadratic interpolation method. **(05)**

(b) Find the minimum of $f(x) = \frac{x(2x-3)}{2}$ with accelerated steps, starting with 0.0 with an initial step size 0.05. **(05)**

END OF PAPER