

.....*M.E Civil Engineering 1st Year*... EXAMINATION, 2017
(1st / 2nd Semester / Repeat / Supplementary / Annual / Bi Annual)

SUBJECT ...*Structural Optimization*
(Name in full)

PAPERXX.....

Full Marks 100
(60 marks for part I)

Time: ~~Two hours~~/~~Three hours~~/~~Four hours~~/~~Six hours~~

Use a separate Answer-Script for each part

No. of Questions	PART I	Marks
	Answer question no. 1 and any two from the rest.	
1.		
a)	A cantilever beam of length ' L ' is subjected to a vertical load ' P_0 ' and moment ' M_0 ' at its tip. Determine the objective function for minimizing the displacements at the tip of the beam. Also find the suitable scaling of the variables to reduce the condition number of the Hessian matrix of this objective function to 1.	20
b)	What is unimodal function? Find the minimum of $f = x(x-1.5)$ by starting from 0.0 with an initial step of 0.05. Use Accelerated search method.	10
2.	Minimize $f(x, y) = 2x^2 + 2xy + y^2 + x - y$ from the starting point $X = \begin{Bmatrix} x \\ y \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$. Use Powell's method . Given, probe length is 0.01.	15
3.	Find the minimum of $f = x^2 - 1.5x$ in the interval (0.0, 1.0) to within 10% of the exact value. Use Dichotomous search method.	15
4.	Find the minimum of $f = \lambda^5 - 5\lambda^3 - 20\lambda + 5$. Given, initial step size, $t_0=0.5$ and $A=0.0$. Use Quadratic interpolation method.	15

M.E.CIVIL ENGINEERING FIRST YEAR SECOND SEM. EXAM. -2017

Subject: STRUCTURAL OPTIMIZATION

Time: Three Hours

Full Marks 100

PART-II (Marks-40)

Use a separate Answer-Script for each part

No. of questions	Answer question no.1 and any two from question no. 2	Marks (15+12.5x2)=40
1.	Using Simplex method Maximize $Z=3X_1+2X_2$ Subjected to $X_1 + X_2 \leq 4$ $X_1 - X_2 \leq 2$ $X_1, X_2 \geq 0.$	15
2.	Answer any two. a) Find the second order Taylor's series of approximation of the function $f(x_1, x_2, x_3) = x_2^2 x_3 + x_1 e^{x_1}$ About the point $X^* = \begin{Bmatrix} 1 \\ 0 \\ -2 \end{Bmatrix}$ b) Find the dimensions of a box of largest volume that can be inscribed in a sphere of unit radius. c) A beam of uniform rectangular cross-section is to be cut from a log having a circular cross-section of diameter $2a$. The beam has to be used as a cantilever beam (the length is constant) to carry a concentrated load at the free end. Find the dimensions of the beam that correspond to the maximum tensile (bending) stress carrying capacity.	12.5 x2 =25