APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY
08 PALAKKAD CLUSTER

Q. P. Code : MD0819052-I **(Pages: 2)** **Name: .....**

Reg. No:.....

SECOND SEMESTER M.TECH. DEGREE EXAMINATION APRIL 2019

Branch: Mechanical Engineering **Specialization: Machine Design**

08ME6052 (A): OPTIMIZATION TECHNIQUES IN DESIGN

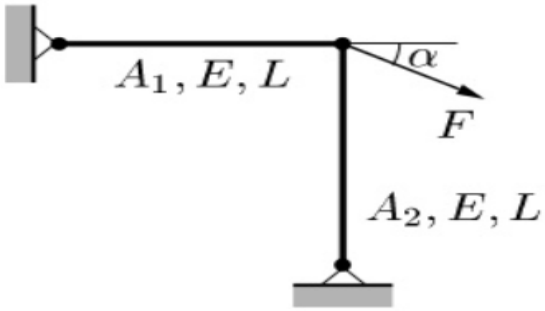
Time:3 hours **Max. marks: 60**

Answer all six questions.

Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

Q No.		Module 1	Marks
1.	a	What is optimization? Explain the flow chart for optimization.	3
	b	Explain in detail the classification of optimization problems. Aso mention some important Engineering applications.	6
	c	Design a sheet metal can using minimum material to hold at least 400 cm3 of water. The diameter of the can should not be more than 8 cm and not less than 3.5 cm. The height should not be more than 18 cm and not less than 8 cm.	6
Q No.		**Module 2**	**Marks**
2.	a	Write the concept of golden section method.	3
	b	Minimize the function $f(x)= x^2+54/x$ using Fibonacci search method	6
	c	Minimize the function $f(x)= 2x^3-3x^2-12x+4$ using Golden Section Method	6
Q No.		**Module 3**	**Marks**
3.	a	What are Lagrangian Multipliers?	3
	b	Maximize the function $f(x)= 2x_1+3x_2$, subjected to $x_1 \leq 6$ $x_1 +2x_2 \leq 10$ $x_1, x_2 \geq 0$	6
	c	Minimize $f(x)= -3x_1^2 -6x_1 x_2 -5x_2^2 +7x_1 +5x_2$ subjected to $x_1 +x_2 =5$ using Lagrangian multipliers	6

Q No.		Module 4	Marks
4.	a	Briefly explain design of a simple truss member.	3
	b	Explain the design of two bar truss for minimization of weight subjected to stress and displacement constraints.	6
	c	Design a two bar truss (as shown) for minimum weight subjected to stress and stability constraints	6



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Q No.		Module 5	Marks
5.	a	What are the objectives for designing a helical spring.	4
	b	How can a shaft be designed which is subjected to axial load in addition to combined torsion and bending loads	8
	c	How can the principles of optimization be effectively utilized in order to design a spring	8

Q No.		Module 6	Marks
6.	a	Consider an internal combustion engine that is modeled as a lumped inertia attached to ground through a spring. Assuming that the system has a measured resonance of 100 rad/s, design an absorber so that the amplitude is 0.01 m for a (measured) force input of 100 N.	4
	b	Optimize the configuration of a vibration absorber of single degree of freedom system using genetic algorithm	8
	c	Explain the methodology for designing the optimum size of linkages for a four bar mechanism	8