Question Paper Code13341M.E. / M.Tech DEGREE EXAMINATIONS, NOV / DEC 2024 (JAN - 2025) First Semester M.E - CAD/CAM 24PCDMA101 - OPTIMIZATION TECHNIQUES IN DESIGN Regulations - 2024Duration: 3 HoursMax. Marks: 100PART - A (10 × 2 = 20 Marks) Answer ALL QuestionsMarks $\frac{K^-}{Leved}$ co1. What is the principles of optimization and write its elements?2KI2. Outline difference between Fibonacci and golden section methods.2K23. Distinguish between Direct and Indirect methods of Constrained2K24. What are Euler-Lagrange equations?2KIC025. State two engineering examples of serial systems that can be solved by dynamic programming.2KIC036. What are the basic operations used in Genetic algorithms?2KIC048. Define parametric constraints.2KIC049. Define mechanism.2KIC0510. Explain about degrees of freedom.2K2C05PART - B (5 × 13 = 65 Marks) Answer ALL Questions11. a) Solve the following problem by applying the Kuhn-Tucker conditions13K3C01Minimum Z = $2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ OR0813K3C01		Pog No											
M.E. / M.Tech DEGREE EXAMINATIONS, NOV / DEC 2024 (JAN - 2025) First Semester M.E - CAD/CAM 24PCDMA101 - OPTIMIZATION TECHNIQUES IN DESIGN Regulations - 2024 Duration: 3 Hours Marks: 100 PART - A (10 × 2 = 20 Marks) Answer ALL Questions 1. What is the principles of optimization and write its elements? 2. KI COI 2. Outline difference between Fibonacci and golden section methods. 3. Distinguish between Direct and Indirect methods of Constrained 4. What are Euler-Lagrange equations? 5. State two engineering examples of serial systems that can be solved by 4. What are the basic operations used in Genetic algorithms? 6. What are the basic operations used in Genetic algorithms? 7. Define transverse load. Give any two examples. 8. Define parametric constraints. 9. Define mechanism. 10. Explain about degrees of freedom. 11. a) Solve the following problem by applying the Kuhn-Tucker conditions 12. K3 COI Marks K ⁻ OR		Reg. No.											
First SemesterME - CAD/CAMAPCPDMA101 - OPTIMIZATION TECHNIQUES IN DESIGNRegulations - 2024Duration: 3 HoursMark S 1000PART - A (10 × 2 = 20 Marks) Answer ALL QuestionsMarks k_{evel} k_{evel} 0 1. What is the principles of optimization and write its elements? 2 k_1 0 1. What is the principles of optimization and write its elements? 2 k_2 0 2. Outline difference between Fibonacci and golden section methods. 2 k_2 0 3. Distinguish between Direct and Indirect methods of Constrained 2 k_2 0 4. What are Euler-Lagrange equations? 2 k_1 0 5. State two engineering examples of serial systems that can be solved by 2 k_1 0 6. What are the basic operations used in Genetic algorithms? 2 k_1 0 7. Define transverse load. Give any two examples. 2 k_1 0 8. Define parametric constraints. 2 k_1 0 9. Define mechanism. 2 k_2 0 ART - B (5 × 13 = 65 Marks)Answer ALL Questions11. a) Solve the following problem by applying the Kuhn-Tucker condition l_3 k_3 0 OR		Question Paper Code	133	341									
ME - CAD/CAM PACDMA101 - OPTIMIZATION TECHNIQUES IN DESIGN Regulations - 2024Parations 3 HoursMax. Jarking 100 and write in a point of the principles of optimization and write in a leanents?Market k_{evel} Col1. What is the principles of optimization and write in a leanents? ki <td c<="" td=""><td colspan="12">M.E. / M.Tech DEGREE EXAMINATIONS, NOV / DEC 2024 (JAN - 2025)</td></td>	<td colspan="12">M.E. / M.Tech DEGREE EXAMINATIONS, NOV / DEC 2024 (JAN - 2025)</td>	M.E. / M.Tech DEGREE EXAMINATIONS, NOV / DEC 2024 (JAN - 2025)											
24PCDMA101 - OPTIMIZATION TECHNIQUES IN DESIGN Regulations - 2024Duration: 3 HoursMax. Marks: 100 $PART - A (10 \times 2 = 20 Marks)$ Answer ALL QuestionsMarks $\frac{K}{Level}$ CO1. What is the principles of optimization and write its elements?2 K1 COI2. Outline difference between Fibonacci and golden section methods.2 K2 COI3. Distinguish between Direct and Indirect methods of Constrained2 K2 CO2Optimization.2 K1 CO25. State two engineering examples of serial systems that can be solved by2 K2 CO3dynamic programming.2 K1 CO36. What are the basic operations used in Genetic algorithms?2 K1 CO37. Define transverse load. Give any two examples.2 K1 CO48. Define parametric constraints.2 K1 CO59. Define mechanism.2 K1 CO510. Explain about degrees of freedom.2 K2 CO5PART - B (5 × 13 = 65 Marks) Answer ALL Questions11. a) Solve the following problem by applying the Kuhn-Tucker conditions13 K3 CO1 Minimum Z = $2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ OR	First Semester												
Regulations - 2024Max. Marks: 100PART - A (10 × 2 = 20 Marks) Answer ALL QuestionsMarks $\frac{K}{Level}$ 01. What is the principles of optimization and write its elements?2K1COI2. Outline difference between Fibonacci and golden section methods.2K2COI3. Distinguish between Direct and Indirect methods of Constrained2K2CO2Optimization.2K1CO25.State two engineering examples of serial systems that can be solved by dynamic programming.2K1CO36. What are the basic operations used in Genetic algorithms?2K1CO48. Define parametric constraints.2K1CO49. Define mechanism.2K1CO510. Explain about degrees of freedom.2K2CO5PART - B (5 × 13 = 65 Marks) Answer ALL Questions11. a) Solve the following problem by applying the Kuhn-Tucker conditions13K3CO1Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ OR	M.E - CAD/CAM												
PART - A (10 × 2 = 20 Marks) Answer ALL QuestionsMarks LevelCo1. What is the principles of optimization and write its elements?2K1CO12. Outline difference between Fibonacci and golden section methods.2K2CO23. Distinguish between Direct and Indirect methods of Constrained Optimization.2K1CO24. What are Euler-Lagrange equations?2K1CO25. State two engineering examples of serial systems that can be solved by dynamic programming.2K1CO36. What are the basic operations used in Genetic algorithms?2K1CO48. Define transverse load. Give any two examples.2K1CO49. Define mechanism.2K1CO510. Explain about degrees of freedom.2K2CO5PART - B (5 × 13 = 65 Marks) Answer ALL Questions11. a) Solve the following problem by applying the Kuhn-Tucker conditions13K3CO1Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ OR													
Answer ALL QuestionsMarks LevelCO1. What is the principles of optimization and write its elements?2K1CO12. Outline difference between Fibonacci and golden section methods.2K2CO13. Distinguish between Direct and Indirect methods of Constrained2K2CO2Optimization.2K1CO24. What are Euler-Lagrange equations?2K1CO25. State two engineering examples of serial systems that can be solved by2K2CO3dynamic programming.2K1CO36. What are the basic operations used in Genetic algorithms?2K1CO48. Define transverse load. Give any two examples.2K1CO49. Define mechanism.2K1CO510. Explain about degrees of freedom.2K2CO5PART - B (5 × 13 = 65 Marks) Answer ALL Questions11. a) Solve the following problem by applying the Kuhn-Tucker conditions13K3CO1Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ OR	Duration: 3 Hours Max. Marks: 100												
1. What is the principles of optimization and write its elements?2KICOI2. Outline difference between Fibonacci and golden section methods.2K2COI3. Distinguish between Direct and Indirect methods of Constrained Optimization.2K2CO24. What are Euler-Lagrange equations?2K1CO25. State two engineering examples of serial systems that can be solved by dynamic programming.2K1CO36. What are the basic operations used in Genetic algorithms?2K1CO37. Define transverse load. Give any two examples.2K1CO48. Define parametric constraints.2K1CO49. Define mechanism.2K1CO510. Explain about degrees of freedom.2K2CO5PART - B (5 × 13 = 65 Marks) Answer ALL Questions11. a)Solve the following problem by applying the Kuhn-Tucker conditions13K3CO1Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ OR										Marks	K– Leve	, со	
2.Outmite difference between Thomater and gorden section methods.3.Distinguish between Direct and Indirect methods of Constrained 2 $K2 CO2$ 0.Optimization.2 $K1 CO2$ 5.State two engineering examples of serial systems that can be solved by 2 $K2 CO3$ 6.What are the basic operations used in Genetic algorithms?2 $K1 CO3$ 7.Define transverse load. Give any two examples.2 $K1 CO4$ 8.Define parametric constraints.2 $K1 CO5$ 9.Define mechanism.2 $K1 CO5$ 10.Explain about degrees of freedom.2 $K2 CO5$ PART - B (5 × 13 = 65 Marks) Answer ALL Questions11.a)Solve the following problem by applying the Kuhn-Tucker conditions $I3 K3 CO1$ Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ OR	1.	. What is the principles of optimization and write its	elen	nen	ts?					2	K1	COI	
SolutionDistributionDirect and mandet memory of constrained Optimization.4. What are Euler-Lagrange equations?2K15. State two engineering examples of serial systems that can be solved by dynamic programming.2K26. What are the basic operations used in Genetic algorithms?2K17. Define transverse load. Give any two examples.2K18. Define parametric constraints.2K19. Define mechanism.2K110. Explain about degrees of freedom.2K2PART - B (5 × 13 = 65 Marks) Answer ALL Questions11. a) Solve the following problem by applying the Kuhn-Tucker conditions13K311. a) Solve the following problem by applying the Kuhn-Tucker conditions13K3OR	2.	2. Outline difference between Fibonacci and golden s	ectio	on n	netho	ods	•			2	K2	COI	
5. State two engineering examples of serial systems that can be solved by 2 K2 CO3 dynamic programming. 6. What are the basic operations used in Genetic algorithms? 7. Define transverse load. Give any two examples. 8. Define parametric constraints. 9. Define mechanism. 10. Explain about degrees of freedom. 10. Explain about degrees of freedom. 11. a) Solve the following problem by applying the Kuhn-Tucker conditions 11. a) Solve the following problem by applying the Kuhn-Tucker conditions 11. a) Solve the following problem by applying the Kuhn-Tucker conditions 11. a) Solve the following problem by applying the Kuhn-Tucker conditions 12. K3 CO1 Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ OR	3.	6	netho	ods	of	C	Con	strai	ned	2	K2	CO2	
b. Solute two engineering examples of serial systems that can be solved by dynamic programming. 6. What are the basic operations used in Genetic algorithms? 7. Define transverse load. Give any two examples. 8. Define parametric constraints. 9. Define mechanism. 10. Explain about degrees of freedom. 10. Explain about degrees of freedom. 11. a) Solve the following problem by applying the Kuhn-Tucker conditions 11. a) Solve the following problem by applying the Kuhn-Tucker conditions 11. a) Solve the following problem by applying the Kuhn-Tucker conditions 12. K3 CO1 Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ OR	4.	What are Euler–Lagrange equations?									K1	<i>CO2</i>	
7. Define transverse load. Give any two examples.2K1CO48. Define parametric constraints.2K1CO49. Define mechanism.2K1CO510. Explain about degrees of freedom.2K2CO5PART - B (5 × 13 = 65 Marks) Answer ALL Questions11. a) Solve the following problem by applying the Kuhn-Tucker conditions13K3CO1Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ ORImage: Colspan="3">OR	5.		ns th	at	can	be	SO	lved	by	2	K2	CO3	
8. Define parametric constraints.2K1CO49. Define mechanism.2K1CO510. Explain about degrees of freedom.2K2CO5PART - B (5 × 13 = 65 Marks) Answer ALL Questions11. a) Solve the following problem by applying the Kuhn-Tucker conditions13K311. a) Solve the following problem by applying the Kuhn-Tucker conditions13K3CO1Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ OR	6.	What are the basic operations used in Genetic algorithms?									K1	CO3	
9. Define mechanism. 9. Define mechanism. 10. Explain about degrees of freedom. PART - B (5 × 13 = 65 Marks) Answer ALL Questions 11. a) Solve the following problem by applying the Kuhn-Tucker conditions 13 K3 CO1 Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ OR	7.	7. Define transverse load. Give any two examples.	Define transverse load. Give any two examples.									<i>CO</i> 4	
10. Explain about degrees of freedom.2K2CO5PART - B (5 × 13 = 65 Marks) Answer ALL Questions11. a)Solve the following problem by applying the Kuhn-Tucker conditions13K3CO1 Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to13K3CO1OR	8.	Define parametric constraints.								2			
PART - B (5 × 13 = 65 Marks) Answer ALL Questions 11. a) Solve the following problem by applying the Kuhn-Tucker conditions ¹³ K ³ CO1 Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ OR	9.	D. Define mechanism.								2	K1	CO5	
Answer ALL Questions 11. a) Solve the following problem by applying the Kuhn-Tucker conditions ¹³ K ³ CO1 Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ OR	10.	0. Explain about degrees of freedom.								2	K2	CO5	
Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$ OR													
	11.	Minimum $Z = 2x_1 + x_1x_2 + 3x_2$ Subject to $x_1^2 + x_2 \ge 3$	Kuh	ın-T	Tucke	er o	con	ditio	ns	13	K3	<i>CO1</i>	
										13	K3	<i>CO1</i>	

12. a) Prove that the shortest distance between two points is a straight line. ¹³ K3 CO2 Show that the necessary conditions yield a minimum and not a maximum.

OR

b) Derive the necessary conditions of optimality and find the solution for ¹³ K³ CO² the following problem: Minimize $f(x) = 5x_1x_2$ Subject to $25 - x_1^2 - x_2^2 \ge 0$

13341

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

13. a) Identify how the Dynamic programming has been applied to solve the ¹³ K3 CO3 following types of engineering problems.

(a) Design of Continuous Beam.

(b) Optimal Layout (Geometry) of a Truss.

OR

- b) Two discrete fuzzy sets, A and B are defined as follows: $A = \{(60, 0.1) (62, 0.5) (64, 0.7) (66, 0.9) (68, 1.0) (70, 0.8) \}$ $B = \{(60, 0.0) (62, 0.2) (64, 0.4) (66, 0.8) (68, 0.9) (70, 1.0) \}$ Determine the union and intersection of these sets.
- 14. a) Derive the expression for torsional rigidity of the shaft.

OR

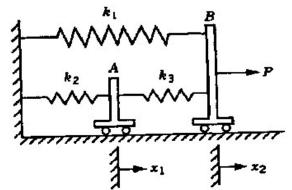
- b) A shaft is transmitting 100 kW at 160 rpm. Find a suitable diameter ¹³ K³ CO⁴ for the shaft, if the maximum torque transmitted exceeds the mean by 25%. Take maximum allowable shear stress as 70 MPa.
- 15. a) A uniform column of rectangular cross section (b X d) is to be ¹³ K³ CO⁵ constructed for supporting a water tank of mass 'M'. It is required to minimize the mass of the column for economy, and to maximize the natural frequency of transverse vibration of the system for avoiding possible resonance due to wind. Formulate the problem of designing the column to avoid failure due to direct compression and buckling. Assume all other relevant data.

OR

- b) i) Develop and write about vibration absorbers and the need of 7 K3 CO5 optimization in their design.
 - ii) Formulate an optimization problem for slider crank mechanism. 6 K3 CO5

PART - C $(1 \times 15 = 15 \text{ Marks})$

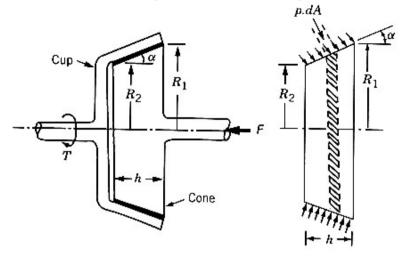
16. a) Figure below shows two frictionless rigid bodies (carts) A and B ¹⁵ K³ CO⁴ connected by three linear elastic springs having spring constants k1, k2 and k3. The springs are at their natural positions when the applied force P is zero. Find the optimal solution of displacements x1 and x2 under the force P by using the principle of minimum potential energy.



K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

13341

b) Find the minimum volume design of the cone clutch shown in Fig. ¹⁵ K3 CO4 such that it can transmit a specified minimum torque.



13341