U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

July 2023 Semester End Main Examinations

Programme: B.E. **Semester: VI**
Branch: Aerospace Engineering **Duration: 3 hrs.**
Course Code: 20AE6DEEDO **Max Marks: 100**
Course: Engineering Design and Optimization **Date: 19.07.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			CO	PO	Marks
		UNIT - I			
1	a)	Discuss the term 'Design is the combination of Science, Technology, Engineering, and Arts' with an example.	CO1	PO	**8**
	b)	Briefly explain the problem-solving methodology for the design.	CO1	PO 1	**6**
	c)	What is design review and list various types of design review.	CO1	PO 1	**6**
		UNIT - II			
2	a)	Explain briefly the House of Quality (HOC) for the product development process.	CO1	PO 1	**6**
	b)	What is Product Design Specification (PDS)? and fill its template with appropriate facts.	CO1	PO 1	**7**
	c)	Explain the various solution-finding methods for product planning.	CO1	PO 1	**7**
		UNIT - III			
3	a)	Explain various mental blocks in creative thinking for concept generation.	CO1	PO 1	**7**
	b)	Explain briefly the systematic methods for mechanical conceptual design generation.	CO1	PO 1	**7**
	c)	Explain the various evaluation methods for concept selection.	CO1	PO 1	**6**
		UNIT - IV			
4	a)	Define embodiment design and discuss its groups.	CO1	PO 1	**7**
	b)	Explain the schematic diagram of the creative idea evaluation process.	CO1	PO 1	**6**
	c)	Explain with the sketch the effect of various manufacturing methods on the possible configuration of features on the right-angle bracket.	CO 3	PO 1 PO 2	**7**

			OR			
	5	a)	Explain the Design for Manufacturing (DFM) and Design For Assembly (DFA) techniques.	*CO1*	*PO 1*	**6**
		b)	What is parametric design? List systematic steps used in parametric design.	*CO1*	*PO 1*	**7**
		c)	Draw the schematic diagram of the shot-buddy example by showing flows to establish product architecture.	*CO3*	*PO 1* *PO 2*	**7**
			UNIT - V			
	6	a)	Draw and explain a constraint surface in a hypothetical two-dimensional design space. Show the various point on it with the contours of the objective function.	*CO 2*	*PO 1*	**10**
		b)	A So Fluffy Pvt Ltd company wants to maximize profit. They have two products: cuddly unicorn pillow and plump cat doll. The company has enough chenille material to produce a maximum of 2 cuddly unicorns pillows and the company also has enough fabric to produce a maximum of 3 plump cat dolls. There's a profit of Rs.15 for the cuddly unicorn and a profit of Rs.10 for the plump cat. There's only enough manpower in this small company to make at most 4 products for the day. Formulate the above problem and use graphical method to find the optimal solution of the above problem.	*CO 2*	*PO1* *PO2*	**10**
			OR			
	7	a)	Briefly explain various optimization programming techniques by stating the application for each.	*CO2*	*PO1*	**10**
		b)	A rocket is designed to travel a distance of 12 s in a vertically upward direction. The thrust of the rocket can be changed only at the discrete points located at distances of 0, s, 2s, 3s, . . . , 12s. If the maximum thrust that can be developed at control point *i* either in the positive or negative direction is restricted to a value of force at F_i, formulate the problem of minimizing the total time of travel under the following assumptions: 1. The rocket travels against the gravitational force. 2. The mass of the rocket reduces in proportion to the distance traveled. 3. The air resistance is proportional to the velocity of the rocket. Formulate the optimization problem (don't solve it).	*CO2*	*PO1* *PO2*	**10**

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