



INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR

Mid-Autumn Semester 2024-25

Date of Examination : _____ Session (FN/AN) _____ Duration 2 hrs
Subject No. : EP 60044 Subject Name : Frugal Engineering
Department/Center/School : Rajendra Mishra School of Engineering Entrepreneurship
Specific charts, graph paper, log book etc., required _____
Special Instructions (if any) : _____

1. Briefly describe the features integral to frugal design (FD) approach, concerning FD Thinking [3]
2. a) Present two examples and state why they be justified as products with frugal characteristics; one in the (a) health/ medtech domain and the other in the (b) automotive domain. [4+4]
3. Illustrate, with the help of a diagram, the conceptual frugal innovation framework involving its two major building blocks for reverse innovation. [4]
4. Expound the steps of any widely used Design Thinking Model comprising its major elements [8]
5. Explicate possible creative design for a proposed 'Frugal Mobile Screen Projector (LumiScreen)' indicating its critical features with a cost analysis to show the frugality aspect of the device. [4]
6. Elucidate on the aspect of 'aesthetics' in frugal industrial product design. [3]

Class Test: Frugal Engineering (EP 60044)

Time: 45 Min

1. There are five criteria to be considered for designing a product with criteria-weights as 5, 7, 8, 4, and 3 in scale of 1-10. The table below contains three sets of advantage-disadvantage scores under three design concepts (DCs) namely, DC1, DC2 and DC3 with respect to the datum reference. Compute total positive and total negative score for each DC and recommend the best one, following a three-way weighted Pugh Method. [3]

DATUM	DC1	DC2	DC3
Datum reference	+1	0	+1
Datum reference	-1	+1	-1
Datum reference	-1	+1	+1
Datum reference	-1	0	+1
Datum reference	0	-1	+1

2. Illustrate the tenets of the Technical Contradiction Matrix of TRIZ. [4]
3. Explicate the concept on Design for Assembly Index (DFA Index). [3]



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End-Autumn Semester 2024-25

Date of Examination : _____ Session (FN/AN) _____ Duration 3 hrs
 Subject No.: EP 60044 Subject Name: Frugal Engineering
 Department/Center/School: Rajendra Mishra School of Engineering Entrepreneurship
 Specific charts, graph paper, log book etc., required _____
 Special Instructions (if any) : _____

- There are seven criteria to be considered for designing a frugal product with criteria-weights as 2, 3, 5, 7, 6, 4, and 8 in scale of 1-10. The table below contains three sets of advantage-disadvantage scores under three design concepts (DCs) namely, DC1, DC2 and DC3 with respect to the datum reference. Compute total positive and total negative score for each DC and recommend the best one, following a five-way weighted Pugh Method. [6]

DATUM	DC1	DC2	DC3
Datum reference	+2	0	+1
Datum reference	-1	+2	-1
Datum reference	-2	+1	+1
Datum reference	-1	0	+2
Datum reference	0	-1	+1
Datum reference	+1	+1	+2
Datum reference	0	0	+1

- Elucidate morphological analysis used in concept generation by preparing an appropriate chart comprising of Sub-functions and 'Design Alternatives' for a coffee-maker for instance. [7]
- Explicate the Technical Contradiction Matrix and its precepts of TRIZ. [6]
- Illustrate the steps of Design for Manufacturing using a diagram and how does DFM/A help in cost containment? [5+3]
- Delineate the usefulness of 'Value Engineering (VE)' as tool in Frugal Designing and elucidate the VE process. [3+6]
- Expound on the Engineering Design Process that can be applied in Frugal Product Development. [8]
- Determine the Reliability of the following system, composed of components with reliability values inscribed, and show the calculation steps. [6]

