



Name :

Roll No. :

Invigilator's Signature :

**CS/M.Tech(IEM)/SEM-2/IEM-203/2013
2013**

PRODUCT DESIGN & DEVELOPMENT

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

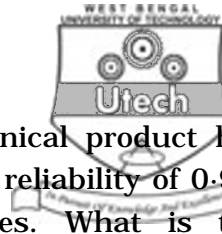
*Candidates are required to give their answers in their own words
as far as practicable.*

Answer any five of the following. $5 \times 14 = 70$

1. a) Elucidate on the concept development and prototyping in product design.
b) Discuss on actions to reduce the cost of components and assembly in the context of DFM. $7 + 7$
2. a) What is concurrent engineering ? What are the alternative names of it ?
b) What is objective and benefits of concurrent engineering ?
c) What are the factors related to the product as well as company for successful implementation of concurrent engineering ? $3 + 5 + 6$
3. a) Classify the models and their uses for product design and development.

30326 (M.Tech)

[Turn over



- b) A circuit board in an electro-mechanical product has four component *A*, *B*, *C* and *D* having reliability of 0.99, 0.995, 0.895 and 0.985 in series. What is the reliability of the circuit board ? Two alternatives planned to increase the reliability of the circuit board to increase its reliability are :
- i) Redesign develop and test a new over designed configuration of component '*C*' at a cost of Rs. 25,500 which would result in a component reliability of 0.954 for component *C*.
 - ii) Modify the circuit board with a back-up component '*C*' which will automatically start functioning if the primary component fails. This use of redundancy in the design would cost Rs. 10,500.

Compute the system reliability of the two alternatives.
Which alternative should chosen ? 7 + 7

4. a) What is rapid prototyping ?
b) What are the various classification of rapid prototyping techniques ?
c) What are the applications of rapid prototyping techniques ?
d) What is reverse engineering ? What are the basic steps of it ? 3 + 4 + 3 + 4
5. a) Explain the concept of "Loss Function" and "Signal to Noise Ratio".
b) Elaborate the method of computation of Signal to Noise Ratio for
- i) Nominal the best
 - ii) Larger the better
 - iii) Smaller the better. 5 + 9



6. a) Elucidate the input and output for 'system level design' and 'detail design' phases of product development.
- b) "Design review, design verification and design validation are essential activities". Explain. 7 + 7
7. a) Criteria and their values are presented for six design alternatives for a product component as below :

Criteria	Design 1	Design 2	Design 3	Design 4	Design 5	Design 6
Torsional Stiffness [lbf-deg]	857.81	1057.3	1128.5	1444.9	1009.26	1430.8
Torsional Stiffness to weight ratio	14.767	17.595	18.761	32.293	16.877	23.141
Frontal Impact [psi]	53,011	47,775	38,961	24,444	36,791	26,238
Roll Over [psi]	33,929	28,835	30,995	28,174	36,176	32,705
CG height [in]	9.64	9.47	9.94	9.78	9.77	9.60

Weight factors for each of the above criterion is provided in a scale of 1 to 10 in the following table.

Criteria	Weight (1 - 10)
Torsional Stiffness	9
Torsional Stiffness to weight ratio	10
Frontal impact	7
Roll over	8
CG height	8

Determine the suitable alternative from the above data using Pugh's selection method.

- b) Describe the roles of Marketing, Design and Manufacturing in product development. 9 + 5

CS/M.Tech(IEM)/SEM-2/IEM-203/2013

8. Write notes on any *two* of the following :



- a) QFD in product development
- b) Phases of product development process
- c) Taguchi tolerance Design for product components
- d) Use of Target Costing in product development
- e) Important dimensions used to assess product development effort and factors of product development.

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