EX/PG/ME/T/1210A/2024

MASTER OF ENGINEERING IN MECHANICAL ENGINEERING

EXAMINATION, 2024

(2nd Semester)

INTRODUCTION TO CONCURRENT ENGINEERING

Time: Three hours Full Marks: 100

(ANSWER ANY FIVE QUESTIONS)

1. a) Explain the concept of 'Concurrent Engineering'. (10)

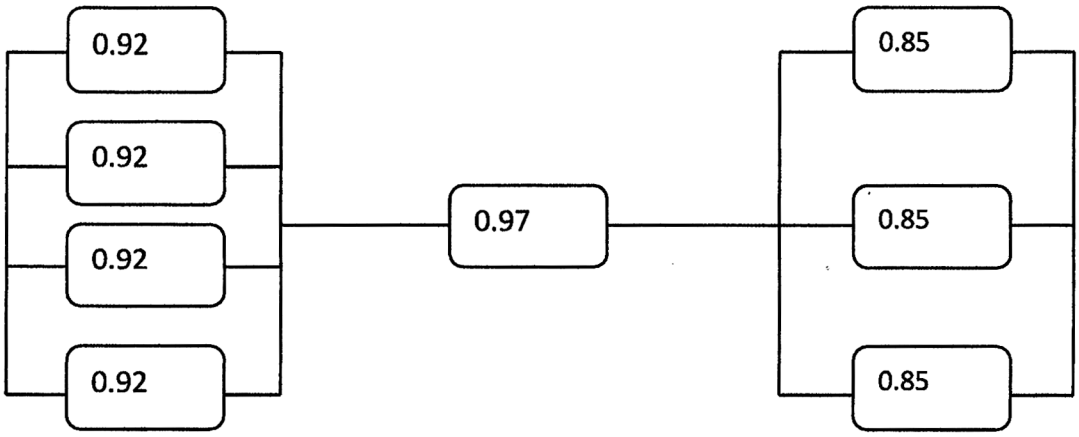
b) Discuss the concepts of 'Modular Design' and DFA (Designing for Assembly)for increasing product effectiveness. (10)

2 a) Briefly explain the 'Taguchi approach to design' (10)

b) Classify different design methods which are intended to help simulate creative thinking. How brainstorming can be applied to generate ideas for solving an old problem: 'Provide a means of securing containers (the large goods containers transported by lorries) that is tamper-proof but easy to open'. (10)

3. a)Discuss the steps in building reliability into a design (10)

b) A complex engineering design can be described by a reliability block diagram as shown below:



In subsystem A two components must operate for the subsystem to function successfully. Subsystem C has true parallel reliability. Calculate the reliability of each subsystem and overall system reliability. (10)

4 a) Consider a process plant working 40 hours per week. In a 46 week year (allowing for plant shutdown for holidays, etc.) total possible working time is 1840 hours. During the year the plant has 20 breakdowns which gave a total downtime of 30 hours. Calculate the reliability statistics.
(05)

4 b)Write short notes (Any Three) (3X5=15)

i)Organisational changes in DFM.

ii) Just-In-Time Production Systems. iii) Fail-safe design

iv) Role of Ergonomics in Engineering Design

5.a) " Traditionally, design and manufacturing activities have taken place sequentially rather than concurrently or simultaneously" – discuss. (10)

b) Explain with suitable examples the concepts of Lean Production. (04)

c) A production machine operates 80 hr/week at full capacity. Its production rate is 20 units/hr. During a certain week the machine produced 1200 parts. Calculate the utilization of the machine during the week under consideration. (06)

6.a) Determine the hourly rate for a work centre from the following data:

Direct labour rate: Rs.200/- per hr. ; Applicable labour factory O/H:40%;

Capital investment in the m/c: Rs. 50 lacs; Service life=8yrs; Salvage Value=0;

Applicable M/C factory O/H: 40%; Rate of return=10%; C R F=0.1875.

The work centre is operated 8hrs. shift/day for 250 days/yr. (10)

b) A batch of 50 pcs is to be manufactured in a factory for a particular customer. Raw materials and tooling are supplied by the customer. The total time for processing the parts is 200 hrs. Direct labour cost=Rs.90/- per hr. The factory O/H rate is 125% and the corporate O/H rate is150%. Calculate cost of the job. 06

c) What are the benefits of adopting Group Technology? (04)

7.a) 'Failure Mode and Effect Analysis'(FMEA) is a team-based methodology for identifying potential problems with new or existing designs'-explain. (05)

b) High quality polymer tubes are being produced for medical applications, where the target wall thickness is 2.6 mm., with an upper specification limit of 3.2 m.m. and a lower specification

limit of 2.0 m.m. If the units are defective, they are replaced at a shipping-included cost of Rs. 10.00/-. The current method produces parts with a mean of 2.6 m.m. and a standard deviation of 0.2 m.m. The current volume is 10000 sections of tube per month.

An improvement is being considered for the extruder heating system. The improvement will cut the variation in half, but it costs Rs. 50,000/- .Determine the 'Taguchi Loss Function' and the payback period for both cases. (10)

c)'Classification of costs as either fixed or variable is not always convenient for

the accounts and finance professionals'-----Why? (05)