MASTER OF ENGINEERING IN MECHANICAL ENGINEERING

EXAMINATION,2017

(2nd Semester)

INTRODUCTION TO CONCURRENT ENGINEERING

Time: Three hours   Full Marks: 100

(50 marks for each part)

Use a separate answer script for each Part

PART-I

Answer question no.*4* and *any two* from the rest

Q1.a) Explain the concept of 'Concurrent Engineering'.   (5)

b) Explain the role of Ergonomics in Engineering Design   (5)

c) Discuss the concepts of a 'Modular Design ' and 'Design for Assembly'(DFA) for

increasing product effectiveness.   (10)

Q2.a) 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'   (5)

b) 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.

(5)

c) 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)

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

b) Differentiate between 'Design Analysis' and 'Design Synthesis'. Illustrate the process of Design Synthesis.   (05)

c) Write down the formulation of a design optimization problem and explain it further with an example.   (05)

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

Subsystem A   Subsystem B   Subsystem C
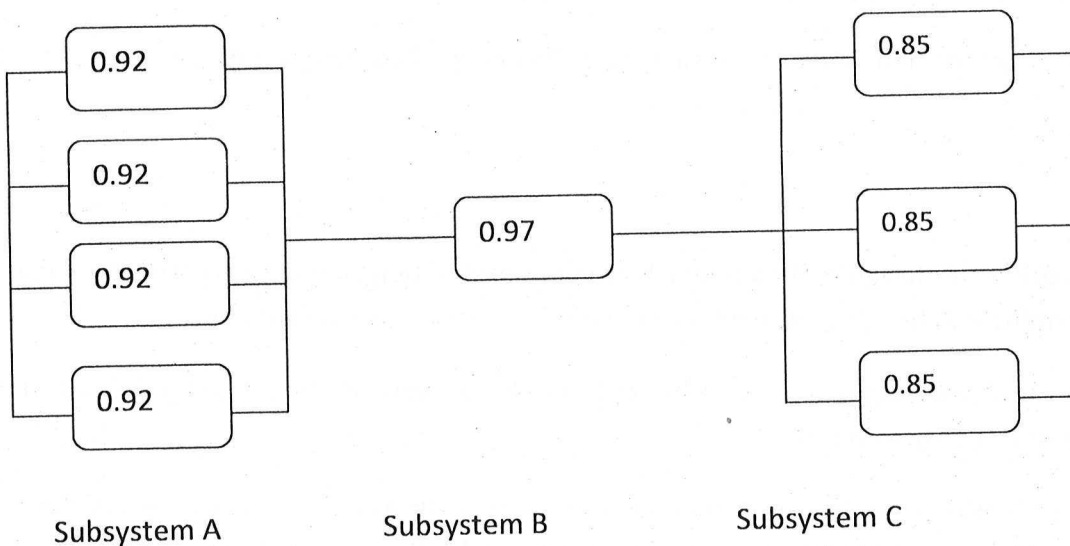
In subsystem A two components must operate for the subsystem to function successfully. Subsystem C has true parallel reliability. Calculate the reliability of each subsystem and overall system reliability. (5)

4. Write short notes (Any Two): (10)

a) Fault Tree Analysis (FTA) --a failure reduction design technique.

b) DFM (Design for Manufacturing) guidelines.

c) Analytical Hierarchy Process (AHP)

PART-II

Answer question no.8 and *any two* from the rest

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

b) Give an outline of the Problem Solving Tools. (10)

6.a) A production m/c operates 80 hrs./week(2 shifts, 5 days) at full capacity. Its production rate is 20 units/hr. During a certain week, the m/c produced 1000 parts and was idle the remaining time.

(i)Determine the production capacity of the m/c.

(ii) What was the utilization of the m/c during the week under consideration?   (10)

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

Direct labor rate: Rs.250/- per hr. ; Applicable labour factory O/H:45%;

Capital investment in the m/c: Rs. 60 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)

7 a) Describe briefly the Electroless coating Process stating its advantages and disadvantages.

(10)

b) Give an overview of MRP-I and MRP-II

(10)

8) Write short notes on (any two):

(2X5=10)

a) Just-In-Time Production Systems   b) Comparison of Lean and Agile manufacturing.

c) Parts classification and coding in Group Technology.