

COLLEGE OF ENGINEERING PUNE
DEPARTMENT OF MECHANICAL ENGINEERING
ENDSEM EXAMINATION 2013-14

Subject : AMD Code ME 401

Max. Marks: (60)

Date: --

Time: 3 Hrs.

Instructions: Attempt any 4 questions. All the sub-questions to a main question should be written at one place.

Que. 1

1. A table top facility is to be designed for medical professionals which can house following equipments and things in it. Stethoscope, blood pressure measuring equipment, blood sugar measuring equipment, pen, pencil, pad for prescribing medicines etc. Write
 - a. Need statement (3)
 - b. Major and minor requirements (3) Classify them into qualitative and quantitative requirements (3)
 - c. Specifications and constraints (3)
 - d. Draw a design space (3)

Que. 2

1. What is compliance? Why does compliance of a component increase with the growth of a crack? (4)
2. Determine critical energy release rate of a DCB specimen loaded in a tensile testing machine. The thickness of DCB specimen is 30mm, depth of each cantilever 12 mm, and crack length 50mm. It is made of mild steel with modulus of elasticity 200MPa and crack is about to propagate at 10,000N pulling load. (4)
3. Write at least three limitations of S-N curve. (3)
4. Find the critical crack length in a centered – cracked plate , loaded in Mode II , if critical stress intensity factor $K_{IIC} = 45\text{MPa}\sqrt{\text{m}}$ and far field shear stress is 100 MPa (4)

Que. No. 3

1. An assembly consists of two components. The properties X_1 and X_2 are given below, with means in centimeters and variance in square centimeters.
 $X_1 \sim N(12, 0.02)$ and $X_2 \sim N(24, 0.03)$. The ~~links are produced by different operators and machines~~ ^{properties X_1 + X_2} and hence are assumed to be independent. A new parameter 'Y' is to be defined such that $Y = X_1 + X_2$; Determine probability P such that $P(35.8 \leq Y \leq 36.2)$. (4)
2. What is the need of defining standard normal distribution to calculate probability? (3)
3. Write two applications of statistical considerations in design? (1)
4. Study Fig. 1 showing three different normal distributions of load and strength. In which case the reliability is high? Why? (3)

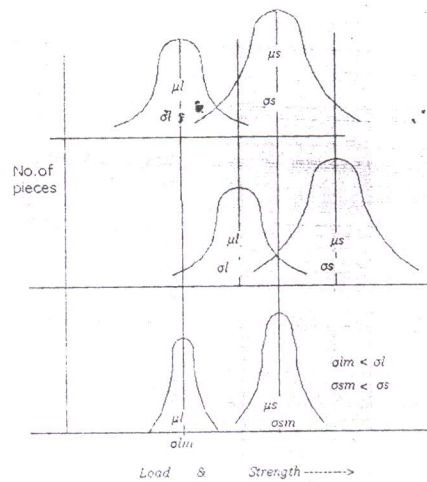


Figure 1

5. The design tolerance of the shaft diameter is 25 ± 0.09 . If the rejection is not to exceed 20%, what should be the natural tolerance? (4) *Assume the process to be centered.*

Que. No. 4

1. Describe the three major sections of design for manufacture and assembly. (6)
2. What is modular Design? (4) (write to the point)
3. Observe Fig. 2a and 2b. Identify the design for assembly principle used in modifying the design. (3)

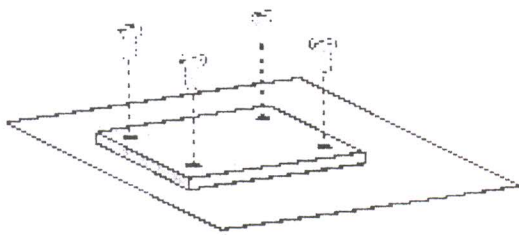


Fig (2a)

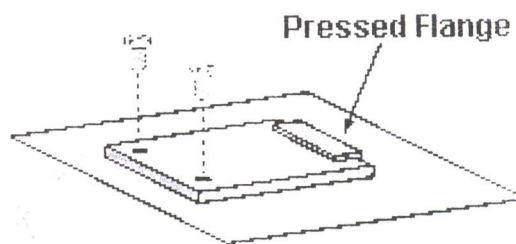


Fig (2b)

4. When can we integrate parts to reduce parts count? (2)

Que. 5

1. Design of a pension scheme is a ----- product where as a design of a keyboard of a PC is a ----- product. (2)
2. Write any three **consecutive** stages in the life cycle of a hard product. (3)
3. Which are the measures of central tendency and dispersion of a data? (3) Which of them are very commonly used? (2)
4. Explain any two micro mechanisms responsible for environment assisted fracture. (5)

