

College of Engineering Pune
Department of Mechanical Engineering
Year (Final B. Tech.) 2014-15
 (Subject: Advanced Machine Design) (ME 401)
Endsem Exam

Day & Date: Nov 2014 00 NOV 2014
 Timing: 2 to 5 p.m.

Max Marks: 60
 Duration: 3 hr.

- Instructions:
1. All questions are compulsory
 2. Write to the point and irrelevant writing will lead to deduction of marks.
 3. Sub questions should be written at one place.
 4. Do not redraw any of the figures in the question paper.

- Q1.**
1. Figure 1 shows two plates which have dimensions as shown. The assembly requires that the plates be placed one above the other in such a way that the centre line of Plate B matches with that of plate A. The height of the assembly should not be more than $(A + B)$. Suggest a self locating feature to the plates so that the assembly becomes easy and precise. (Refer to Fig.1) 2
 2. What is concurrent engineering? Write atleast four points showing its significance in design for manufacture. 8
 3. Explain three major sections in which design for manufacture and assembly has been divided. 6

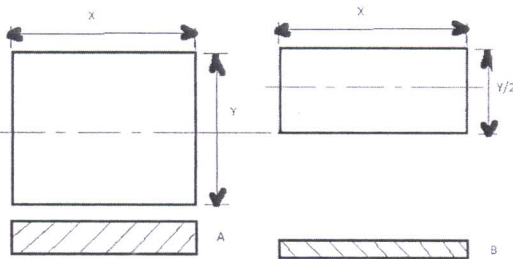


Fig. 1

- Q2.**
1. If you find that a crack in component results in $K_I > K_{IC}$, what are the different options available to avoid such a dangerous situation? 2
 2. State two advantages of the principal "Use a stable base" in assembling. 2
 3. Aim behind using DFM is ----- and ----- from manufacturer's point of view. 2
 4. Give at least two reasons of variability in the following case. 2
 (a) mechanical properties of a material
 5. The design of a clutch pedal for a new four wheeler was revised twice due to non availability of a particular raw material. How this will affect the product in the market where many other manufacturers are bringing in new two wheelers? 2
 6. Manufacturing is a stage in the life cycle of -----whereas implementation is a stage in the life cycle of----- 2
 7. What is design space? Explain with example. 2
- Q3.**
1. Fluctuating load on a component of an aircraft is shown by a histogram below. An edge crack is of length 2mm is detected. If crack length is not allowed to exceed 20mm, determine remaining life of the component. Use paris law with material constant C which is given by $5.28 \times 10^{-12} (\text{MPa})^{-3.2} \text{m}^{-0.6}$ and $m=3.2$ (Refer to Fig.2) 4
 2. Why is it required to extend machined notch by fatigue for K_{IC} test? 2
 3. Does fracture mechanics recommend the enhancement of yield stress of an alloy through heat 2

treatment? Why?

4. Write short note on any one of the following 4

- (a) Design Approaches
- (b) Deep Encounter
- (c) Chance Intrusion
- (d) Modular Design

5. Write a need statement for the following problem: A facility is to be designed for storing 2
chappals / shoes of a family of four (2 adults + 2 minors). The condition is that it should not
occupy floor space and should be easily cleaned. 2

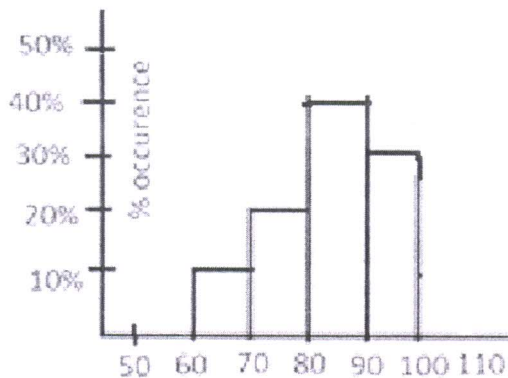


Fig. 2

Q4

1. The distribution of load on a shaft is given by $N(500, 400)$ MPa. Assuming the strength also to be normally distributed, calculate the mean and variance of strength for the factor of safety to be 1.25 and reliability to be 99%. 4
2. In a sample of 200 bearing bushes internal diameter is normally distributed with mean of 30.01mm and a standard deviation of 0.008mm. The upper and lower limits for internal diameter specified by the designer are 30.02 and 30.00 mm respectively. Calculate the percentage of rejected bushes. 4
3. A load acting on a screw jack is normally distributed with mean of 50kN and std. deviation of 10kN. (a) What is the probability that the selected load at random will be less than 50kN. 4
(b) What is the probability that the load selected at random will be more than 65kN?
4. A hole is machined with the diameter of 25 ± 0.03 mm on a machine. If the % rejection is not to be more than 10%, calculate the design tolerance on the diameter of the hole. Assume the process to be centered. 4

