

**B.Tech. MECHANICAL ENGINEERING
(COMPUTER INTEGRATED
MANUFACTURING)**

Term-End Examination

December, 2019

00603

BME-024 : MECHANICAL ENGINEERING DESIGN

Time : 3 hours

Maximum Marks : 70

***Note :** Answer any **five** questions. All questions carry equal marks. Use of calculator and design handbook is permitted. Assume the missing data, if any. All symbols used have their usual meaning.*

1. (a) Classify carbon steels with their applications. 7

(b) Name different theories of failure. Briefly describe maximum principal stress theory to calculate design stress. What is the significance of factor of safety ? 1+5+1
2. (a) Define stress concentration and stress concentration factor. 5

- (b) A 52 mm wide plate reduces in width to 40 mm as shown in figure 1. The steel plate is heat treated to have a tensile strength of 950 N/mm^2 and yield strength of 700 N/mm^2 . The notch is ground finished, q (sensitivity index) for the steel is 0.9. Assume that the plate has no side effect. The plate is subjected to axial fluctuating load which varies between $5F$ and $2F$. Calculate the load that can be applied on the plate.

9

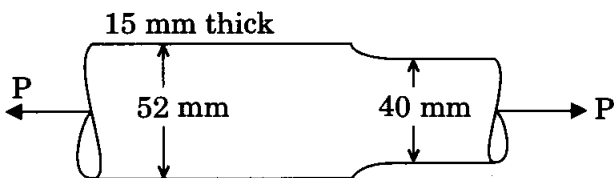


Fig. 1

3. (a) Mention the advantages of standardization. 7
- (b) What reason can you put forth for preferring the acme threads to square threads? 7
4. (a) Describe the steps involved in designing screw. 7
- (b) Define efficiency of riveted joint and write expressions for various strengths. 7

5. (a) Describe various applications of springs and mention common carbon and alloy steels (composition) used for making helical spring. 7
- (b) Define equivalent bending moment and equivalent torque in case of designing a shaft for any mechanical design. 7
6. (a) Enumerate methods of power transmission. What are mechanical power transmission systems? 7
- (b) Derive an expression for tensions ratio in flat belt $\frac{T_1 - T_c}{T_2 - T_c} = e^{\mu\theta}$. 7
7. (a) Define and show on sketch
 (i) arc of contact, and
 (ii) patch of contact
 in a typical gearing. 7
- (b) Describe materials in which gears are made. Which material is commonly used in making gears and why? 7
8. (a) What are the different types of friction that may occur in a journal bearing? 5
- (b) What criteria are considered for selection of bearing material? 4
- (c) Distinguish between a dog clutch and friction clutch. 5
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