

E-ME-551**B. E. (Fifth Semester) Examination,****Nov.-Dec. 2015****(New Course)****(Mechanical Engg.)****MACHINE DESIGN-I****Time Allowed : Three hours****Maximum Marks : 80****Minimum Pass Marks : 28**

Note : Attempt any one from between (b) and (c) of each questions. Part(a) of each question is compulsory. Use of PSG databook & ISI data sheets are allowed in original in examination hall.

1. (a) What do you mean by factor of Safety (FS)? 2
- (b) Explain in details the following theories of elastic failures : 14

E-ME-551**PTO**

121

- (i) Maximum principal stress theory
 - (ii) Maximum shear stress theory
 - (c) A forged steel bar, 50 mm in diameter is subjected to a reversed bending stress of 250 N/mm^2 . The bar is made of steel 40C8 ($S_{ut} = 600 \text{ N/mm}^2$). Calculate the life of the bar for a reliability of 90%. 14
2. (a) List the various functions of keys. 2
- (b) Prove that a square key is equally strong in shear and compression. 14
- (c) Design a rectangular key for a shaft for a shaft of 75 mm diameter. The shearing and crushing stresses for key material are 50 N/mm^2 and 75 N/mm^2 respectively. http://www.prsunotes.com 14
3. (a) What do you mean by Shaft? Write its functions. 2
- (b) Explain briefly about the design of shaft based on various criteria. 14
- (c) The layout of an intermediate shaft of a gear box supporting 2 spur gears B and C. The shaft is mounted in two bearings A and D. The pitch circle diameter of gears B and C are 900 mm and 600 mm respectively. The material of the shaft is steel FeE

E-ME-551

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580 ($\sigma_w = 770 \text{ MPa}$ & $\sigma_v = 580 \text{ MPa}$) $K_b = 1.5$
and $K_t = 2.0$. Determine the shaft diameter using the
ASME code. Assume that the gear are connected to
the shaft by means of keys. [see fig.(a)]

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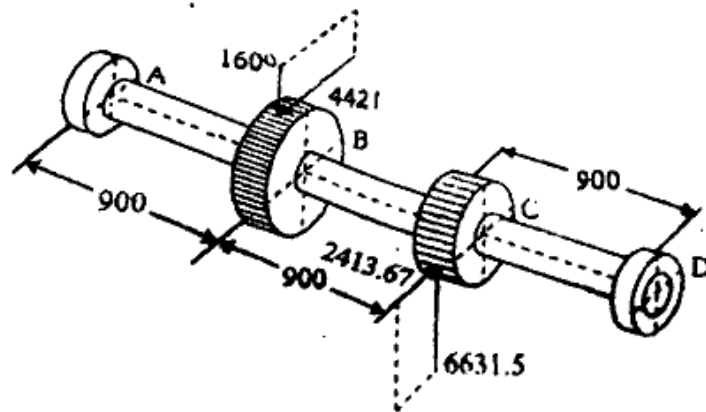


fig.(a)

4. (a) Draw the neat sketch for Tap bolt and Stud. 2
- (b) Explain the bolted joint in tension. Also explain force deformation diagram of bolted joint. 14
- (c) A bracket is subjected to a load of 40 kN as shown in fig. (b). If the permissible tensile strength and the permissible shear strength for the bolts are 50 MPa

E-ME-551

PTO

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and 30 MPa respectively. Determine the size of the bolts.

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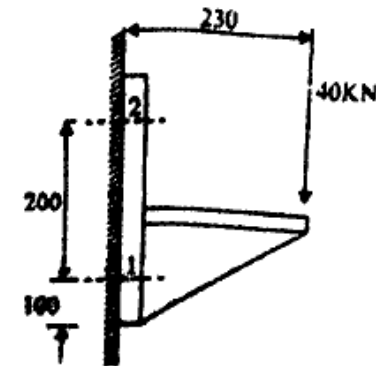


fig. (b)

5. (a) What are the different types of Joints? 2
- (b) Discuss about the various modes in which a riveted joint may fail. 14
- (c) Explain in details the design of longitudinal butt joint for a boiler. 14

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