Machine Design-1
(ME-301, Dec 2006)

Time: 3 Hours   Max. Marks: 60

Note: Question No. 1 is compulsory. Attempt any four questions from section B and two questions from section C.

Section-A
1. (a) What do you understand by mechanical engineering design?
   (b) How will you designate grey CI with Ultimate tensile strength of 300 N/mm^2.
   (c) What is stress concentration factor?
   (d) Explain the significance of Soderberg & Goodman diagram.
   (e) Explain four different types of welded joints.
   (f) Explain the difference between rigid and flexible coupling.
   (g) Sketch four different rivet head as per Indian standard.
   (h) Write the expression for the tearing strength of spigot.
   (i) What is the function of key? Sketch any two types of keys with suitable sketch?
   (j) What is the difference between muff coupling and pin & bush coupling?

Section-B
2. Discuss factors which govern the selection of a material for a machine component.
3. What do you understand by a reversed or cyclic stress? Explain.
4. Two lengths of shafts are connected through a flange coupling provided with four bolts of same material as shaft. The bolts are set in reamed holes located on a bolt circle of 25 mm diameter. Determine least bolt size to transmit the same torque. Justify the final bolt size.
   Chosen

	Pitch P mm	Pitch dia d_p (mm)	Major D mm	Minor dia d_c mm	Stress N/mm^2
M10	1.5	9.026	8	6.466	36.6
M12	1.75	10.863	10	8.160	58.00
M16	2.00	14.701	12	9.853	84.3

5. A tensile load of 15T is acting on a plate joined together by a 14 mm fillet lap weld. The cross section of a smaller plate is is 1.5 x 7.5 cm. Determine length of weld which is to be provided along the sides parallel to load line if allowable stress for weld is 790 kg/cm^2.
6. State the application of hand levers. Discuss the procedure for designing a hand lever.

Section-C
7. List out various modes of failures while designing a gib and cotter joint. Explain one of them in detail.
8. (a) Design a suitable key for a flange coupling to transmit 5 HP at 1440rpm. C-40 steel is used for shafts & keys. The following data may be used for design.
   Factor of safety = 2.5
   Fatigue reduction factor K_f = 1.6
   Allowable stress for C-40 = 3300 kg/cm^2
   (b) Explain how would you determine the strength of transverse and parallel fillet weld joint?
9. (a) Determine the required diameter of a uniform circular shaft carrying two equal pulley of 200 kg each. The shaft is 159 cm long simply supported at its two ends. The pulleys are so located that they divide the shaft in three equal parts. Belt pull on left pulley is 10 KN acting horizontal & pull on right pulley is 10 KN acting vertically downward. The shaft transmits a torque of 4 KNm between two pulleys. Assume a combined shock & fatigue factor 1.5 and safe shearing stress 800 kg/mm^2.
   (b) Explain the various types of pipe joints commonly used in engineering practice.