Code No: 09A50305 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B. Tech III Year I Semester Examinations, November/December-2013
DESIGN OF MACHINE MEMBERS-I
(Mechanical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) Define clearly factor of safety. Explain briefly the difference between design procedure based on strength and rigidity

b) What do you mean by alloy steel? Write the effects of the following alloying elements on steel:
i) nickel ii) chromium. [15]

2.a) What is difference between Goodman line and Soderberg line..

b) Determine the thickness of a 120 mm wide uniform plate for safe continuous operation if the plate is to be subjected to a uniformly varying tensile load that has a maximum value of 250 kN and a minimum value of 100 kN. Properties of plate material: endurance limit stress=225 MPa, yield point stress=280 MPa, factor of safety=1.8. [15]

3. Design and sketch a triple riveted double strap, chain butt joint suitable for a longitudinal joint for a pressure vessel having 1,5 m diameter and working pressure of $2N/mm^2$.The permissible stresses are:80 MPa in tension,120 MPa in crushing and 60 MPa in shear. [15]

4.a) What is the effect of gasket, on the resultant load on the bolt, in a bolted joint.

b) A single plate clutch transmits 20 kW at 1200 rpm. The driving unit is connected to the shaft by means of 4 bolts placed at 12 cm p.c.d. Find the suitable bolt diameter if permissible stress is limited to $2 kN/cm^2$. [15]

5.a) Discuss different types of keys with sketches.

b) Design a socket and spigot type cotter joint to resist a load of 3.5 kN. Assume safe stresses as: f_t=5.6 kN/cm^2; f_s=4.5 kN/cm^2; f_c=9.8 kN/cm^2 [15]

6. A shaft 90 cm between bearings supports a 60 cm pulley 30 cm to the right of the left hand bearing and the belt drives a pulley directly below. Another pulley 45 cm in diameter is located 20 cm to the left of the right hand bearing and the belt is driven from a pulley horizontally to the right. The angle of contact of both the pulleys is 180^0 and the tension ratio is 2.2. The maximum tension in the belt on a 60 cm diameter pulley is 2250 N. Determine suitable diameter for a solid shaft allowing f_t= 63 N/mm^2, f_s=42 N/mm^2. [15]

7. Design a bushed type of flexible coupling for transmitting 5 kW at 960 r.p.m. The permissible stresses for coupling are 65, 35 and 100 MPa in tension, shear and compression respectively. [15]

8.a) Discuss why Wahl's factor is considered in the design of helical springs.

b) A spring loaded safety valve for a boiler is required to blow-off at a pressure of $1.8N/mm^2$. The diameter of the valve is 65 mm. Design a suitable compression spring for the safety valve assuming spring index to be 6 and 25mm initial compression. The maximum lift of the valve is 15 mm. The shear stress in the spring material is limited to 480MPa. Take $G= 0.84\times 10^5$ MPa. [15]

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