B. Mechanical (Evening) 3rd Yr 1st Sem Supple Exam- 2017

Machine Design II

Time:3hrs (Answer any five from the following) Full marks: 100

(Assume data if missing)

---

1. Design with neat sketch a cotter joint to connect two steel rods of equal diameter. Each rod is subjected to an axial tensile force of 60 kN. The material of rods, spigot, socket and cotter is plain carbon steel of Grade 35C8 (σ_{yt}= 380N/mm^2) and the factor of safety for rods, spigot and socket is 5, while for cotter, it is taken as 3. 20

2. (a) A welded connection, as shown in Fig. 1 is subjected to an eccentric force of 7.5 kN. Determine the size of welds if the permissible shear stress for the weld is 100 N/mm^2. Assume static conditions.

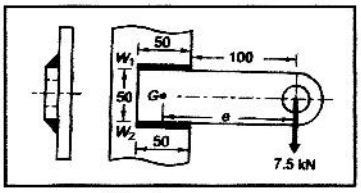

Fig. 1

(b) Show by neat sketches the various ways in which a riveted joint may fail. (10+10)

3. (a) Show that the energy dissipated during clutching operation is independent of torque and directly proportional to the square of relative velocity of driving and driven shafts.
(b) Using uniform wear theory, show that in a disc clutch torque transmission is maximum when ratio R_1/R_2=0.577, where R_1=inner radius and R_2=outer radius of clutch. Draw a graph between torque and R_1/R_2 ratio. (12+8)

4. (a) Draw the free body diagram of forces of simple band brakes and determine the self-locking condition when the brake dram rotates in clockwise direction.
(b) Refer to the simple band-brake shown in Fig. 2 and assume the following data: a=260 mm, l=750 mm, θ=225^0, R=250 mm. The width of the friction lining is 70 mm and the coefficient of friction is 0.3. The maximum intensity of pressure is 0.25 N/mm^2. Calculate
(i) the band tension on tight and loose sides;
(ii) the actuating force; and
(iii) the torque capacity of the brake.

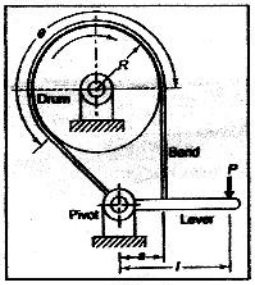

Fig. 2

(8+12)

---

5. (a) Explain with classification the different types of coupling and their different.
(b) A flexible coupling is used to connect 15 kW power at 100 rpm. There are six pins and their pitch circle diameter is 200 mm. The effective length of the bush (l_b), the gap between two flanges and the length of the pin in contact with the right hand flange are 35, 5 and 23 mm respectively. The permissible shear and bending stresses for the pin are 35 and 152 N/mm^2 respectively. Calculate: (a) pin diameter by shear consideration; and (b) pin diameter by bending consideration. (8+12)

6. The cross leather belt drive capable of transmitting 7.5 kW power. The belt, 6 mm thick and operates at a velocity of 13 m/s approximately. The coefficient of friction is 0.3 and the permissible tensile stress for the belt material is 1.75 N/mm^2. The density of leather is 0.95 g/cc. The driving pelley (rotate clockwise) and driven pulley rotate at 1000 rpm and 500 rpm respectively. Centre distance between two pulleys are 1500 mm. Calculate:
(i) The diameter of pulleys;
(ii) The length and width of belt and
(iii) Belt tensions on the tight and loose sides. 20

7. (a) Compare different types of gears, namely spur, helical, bevel and worm gear in tabular format and explain all the classifiers used in the comparison.
(b) Determine the stress and deflection equation of a closed coiled helical spring. Sketch the distribution of shear stresses in the wire of helical spring? What is Wahl Factor? Why is it used? (10+10)