

GUJARAT TECHNOLOGICAL UNIVERSITY**PDDC-Semester –III (May-2012) Examination****Subject Code: X31903****Subject Name: Machine Design & Industrial Drafting****Date: 16/05/2012****Time: 02.30 pm – 05.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Design and draw a knuckle joint to support a load 25 KN. Material used is carbon steel having tensile stress 60 MPa. , Compressive stress 120 KN, Shear stress is 30 Map, Bearing Stress is 25 Map. **07**

(b) What is factor of safety? Describe various factors influencing the value of factor of safety. **07**

Q.2 (a) Explain basic procedure for design of muff coupling. **07**

(b) A line shaft transmits 20 KW power at 250 rpm by means of a vertical belt drive. The diameter of belt pulley is 1 meter and the pulley overhangs 150 mm beyond the center line of the end bearing. The belt tension acts vertically downwards. The tension on the right side of the belt is 2.5 times than on the slack side. The shaft is made of plain carbon steel 40 C8 (Sty = 380 Map.) and factor of safety 2.0. The mass of the pulley is 10 kg. Determine the diameter of the shaft. **07**

OR

(b) Design and sketch the muff coupling which is used to connect two shafts transmitting 40 kW at 200 rpm. Permissible tensile stress 100 Map, in shear 60 Map in crushing 70MPa. Material for muff is cast iron having shear stress 20 Map. **07**

Q.3 (a) Define the following terms. **07**

Leverage, mechanical advantage, effort, load arm

(b) Design a right angled Bell crank lever. The horizontal arm is 400 mm long and at a load of 4 KN. acts vertically downward through a pin in a forked end of this arm. At the end of 150 mm long arm which is perpendicular to 400 mm arm, a force P acts at right angle to the axis of 150mm through a pin in to the forked end. The lever and pins are having same material. Safe stress in tension is 100 Map, safe stress in shear 50 Map, safe bearing pressure on pin 15 Map. **07**

OR

Q.3 (a) Explain maximum principle stress theory and von misses stress theory. **07**

(b) For exhaust valve of petrol engine, the maximum load required on the valve is 2000 N. The rocker arm oscillates around a pin whose centre line is 200 mm away from the valve axis. The two arms are equal and make an included angle of 160° . Design a rocker arm with a fulcrum if the tensile stress is 70 Map. And bearing pressure is 10 N/mm². Assume cross section of the arm is rectangle. Design lever assembly **07**

Q.4 (a) Explain Design Procedure of welded joints. **07**

(b)

07

The bracket as shown in **Fig. 1** is to carry a load of 45 kN. Determine the size of the rivet if the shear stress is not to exceed 30 Map . Assume all rivets of the same size. Use the **Table No: 1**, which is given for the standard diameter of rivet and rivet hole.

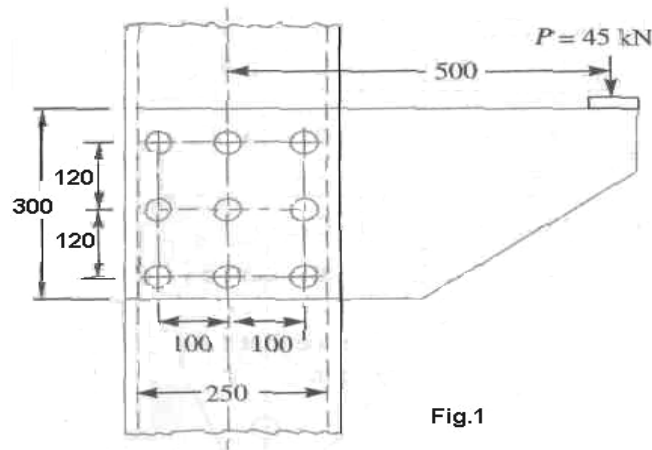


Fig.1

Basic size of rivet mm	12	14	16	18	20	22	24	27	30	33	36	39	42	48
Rivet hole diameter mm	13	15	17	19	21	23	25	28.5	31.5	34.5	37.5	41	44	50

Table No: 1

OR

- Q.4 (a)** Explain the types of riveted joints 07
- (b)** A double riveted single row butt joint is used to connect two plates of thickness 22 mm each. The diameter of the rivets is 30 mm each. The pitch between the rivets is 100 mm. The load applied on the plate is such that the tensile stress developed in the plates is 75 Map . What is the shearing and bearing stresses on rivets? What is the thickness of the cover plate? 07

- Q.5 (a)** Define the following terms used in screw threads. 07
- a) Pitch b) Lead c) Crest d) Root
- (b)** Compare the weight, strength and stiffness of hollow shaft of the same external diameter as that of solid shaft. The inside diameter of hollow shaft being half the external diameter. Both the shafts have the same material and the length. 07

OR

- Q.5 (a)** (1) Why are square threads preferable to V-threads for power transmission? 07
- (2) What is self-locking and overhauling property of threads and where it is necessary?
- (b)** An electric motor driven power screw moves a nut in a horizontal plane against a force of 75 kN at a speed of 300 mm/min. The screw has a single square thread of 6 mm pitch on a major diameter of 40 mm. The coefficient of friction at screw thread is 0.1. Estimate the power of motor. 07
