

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-III EXAMINATION – WINTER 2015

Subject Code:131902**Date:21/12/2015****Subject Name: Machine Design and Industrial Drafting****Time: 2:30pm to 5:30pm****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) 1. Explain hole-based and shaft based limit system with neat sketch. **04**
 2. Define limits, fits & upper deviation. **03**
 (b) Define the following : **07**
 1) Proof Resilience 2) Preferred Number 3) Factor of Safety 4) Residual Stress
 5) Principle Stress 6) Impact Load 7) Shock Load.
- Q.2** (a) 1. What is Caulking and Fullering as related to riveted joints? **04**
 2. Draw neat sketch of Double riveted zig-zag lap joint. **03**
 (b) Design longitudinal joint for boiler whose diameter is 2.4 meters and is subjected to a pressure of 1 N/mm². The longitudinal joint is a triple riveted butt joint with efficiency of about 85%. The pitch in outer rows of rivets is to be double than in inner rows and width of cover plates are unequal. The allowable stresses are: $\sigma_t = 77$ MPa; $\tau = 56$ MPa and $\sigma_c = 120$ MPa **07**
- OR**
- (b) A bracket is supported by means of four rivets of same size as shown in Figure 1. Determine the diameter of rivet if the maximum shear stress is 140 MPa. **07**
- Q.3** (a) Explain step by step design procedure for sleeve and cotter joint. **07**
 (b) Design a socket and spigot cotter joint to transmit an axial load of 90 kN. **07**
 Permissible stresses for socket, spigot and cotter are 90 MPa, 120 MPa and 60 MPa in tension, crushing and shear respectively.
- OR**
- Q.3** (a) 1. Derive equations to get strengths of transverse and parallel fillet welds with sketch. **04**
 2. A welded joint as shown in Figure 2, is subjected to an eccentric load of 2 kN. Find size of weld, if maximum shear stress in weld is 25 MPa. **03**
 (b) The pull in tie rod of a roof truss is 45 kN. Design a suitable adjustable screw joint. The permissible tensile and shear stresses are 75 MPa and 40 MPa respectively. **07**
- Q.4** (a) Under what circumstances are hollow shafts preferred over solid shafts? Give any two examples where hollow shafts are used. How they are generally manufactured? **07**
 (b) A belt pulley is keyed to shaft, midway between supporting bearings kept at 1000 mm apart. The shaft transmits 20 kW power at 400 rpm. Pulley has 400 mm diameter. Angle of wrap of belt on pulley is 180° and belt tensions act vertically downwards. The ratio of belt tensions = 2.5. The shaft is made of steel having $\tau = 54$ MPa. Find diameter of shaft taking combined fatigue and shock factors in bending and torsion as 1.5 and 1.25 respectively. **07**

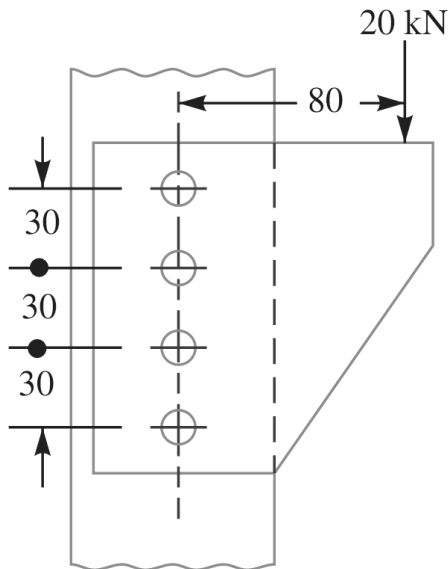
OR

- Q.4 (a)** 1. What is shaft coupling? Enlist different couplings stating its applications. **04**
2. Explain saddle, Woodruff and feather keys. **03**
- (b)** Design flange coupling for steel shaft transmitting 15 kW at 200 rpm and **07**
having allowable shear stress of 40 MPa. Shearing in bolts should not exceed 30 MPa. Assume that same material is used for shaft and key and crushing stress is twice the value of shearing stress. Maximum torque is 25% greater than full load torque. The shear stress for cast iron is 14 MPa.

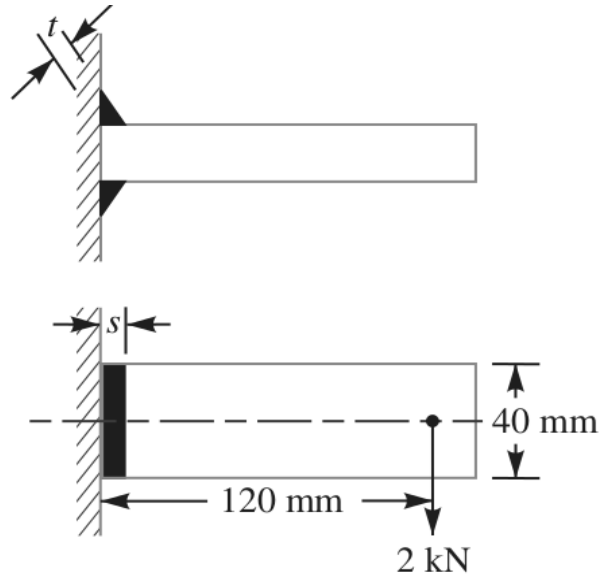
- Q.5 (a)** 1. Prove that efficiency of self locking screws is less than 50 percent. **04**
2. Derive the formula for efficiency of square threaded screw. **03**
- (b)** The mean diameter of square threaded screw having pitch of 10 mm is 50 mm. **07**
A load of 20 kN is lifted through a distance of 170 mm. Find work done in lifting the load and efficiency of screw, when,
1. The load rotates with the screw, and
2. The load rests on the loose head which does not rotate with the screw.
The external and internal diameters of bearing surface of loose head are 60 mm and 10 mm respectively. The coefficient of friction for screw and bearing surface may be taken as 0.08.

OR

- Q.5 (a)** A lever loaded safety valve is 70 mm in diameter and is to be designed for a **07**
boiler to blow off at pressure of 1 N/mm² (gauge). Design suitable mild steel lever using following data.
Tensile stress = 70 MPa, Shear stress = 50 MPa, Bearing pressure = 25 MPa.
Pin is also made of mild steel. Distance of fulcrum to weight on lever is 880 mm, and distance between fulcrum and pin connecting valve spindle links to lever is 80 mm.
- (b)** Explain following AutoCAD command with example. **07**
(1) Copy, (2) Mirror, (3) Polyline, (4) Trim (5) Extend, (6) Hatch, (7) line



(Figure. 1, All dimensions are in mm)



(Figure. 2)
