

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- Vth SEMESTER-EXAMINATION – MAY/JUNE - 2012****Subject code: 151805****Date: 06/06/2012****Subject Name: Elementary Design and Drawing****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) Explain the following terms: **07**

1. Stiffness
2. Elasticity
3. Toughness
4. Interchangeability
5. Shear Modulus
6. Working stress
7. Factor of Safety

(b) Explain the following heat treatment processes: **07**

1. Normalising
2. Tempering

Q.2 (a) Explain the general design procedure in machine design. **07**

(b) Discuss the design procedure of sleeve and cotter joint. **07**

OR

(b) Design hub, key and flange of a cast iron protective type flange coupling to transmit 15 kW at 900 r.p.m. from an electric motor to a compressor. The service factor may be assumed as 1.35. Take width of the key is 12 mm. The following permissible stress may be used: **07**

Shear stress for shaft and key material = 40 MPa;

Crushing for key material = 80 MPa;

Shear stress for cast iron = 8 MPa;

Q.3 (a) Show by neat sketches the various ways in which a riveted joint may fail. Explain also the difference between caulking and fullering with neat sketches. **07**

(b) Two plates of 7 mm thick are connected by a triple riveted lap joint of zig-zag pattern. Calculate the rivet diameter, pitch, and the back pitch for the joint. Also state the mode of failure of the joint. The ultimate stresses are as follows: **07**
 $F_t = 360 \text{ MPa}$, $\tau = 240 \text{ MPa}$ and $f_c = 480 \text{ MPa}$. Take FOS as 4.

OR

Q.3 (a) A shaft supported at the ends in ball bearings carries a straight tooth spur gear at its mid span and is to transmit 7.5 kW at 300 r.p.m. The pitch circle diameter of the gear is 150 mm. The distance between the centre line of bearings and gear are 100 mm each. If the shaft is made of steel and the ultimate shear stress is 135 MPa, determine the diameter of the shaft. Assume FOS as 3. The pressure angle of the gear is 20°. **07**

(b) A rectangular cross-section bar is welded to a support by means of fillet welds as shown in **fig. (1)**. Determine the size of the welds, if the allowable shear stress in the weld is limited to 75 MPa. **07**

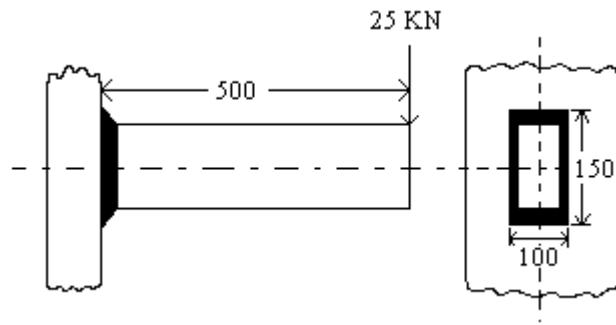


Fig. (1)

- Q.4 (a)** List all the modes of failure of Knuckle joint. Explain any two of them. **07**
- (b)** A solid cast iron disc, 1 m in diameter and 0.2 m thick, is used as a flywheel. It is rotating at 350 r.p.m. It is brought to rest in 1.5 sec by means of a brake. The mass density of cast iron is taken as 7200 kg/m^3 . Take radius of gyration of solid disk about its axis of rotation is $(d/\sqrt{8})$. **07**

Calculate:

1. The energy absorbed by the brake; and
2. The torque capacity of the brake.

OR

- Q.4 (a)** Discuss the merits and demerits of V-Belt drive over Flat Belt drive. **07**
- (b)** A cone clutch with asbestos friction lining material transmits 30 kW at 500 r.p.m. **07**
The coefficient of friction is 0.2 and the permissible intensity of pressure is 0.35 MPa. The semi cone angle α is 12.5° . The outer diameter is fixed as 300 mm from space limitations. Assuming the uniform wear theory. Calculate:
1. The inner diameter;
 2. The face width of the friction lining; and
 3. The force required to engage the clutch.

- Q.5 (a)** Explain the following terms: **07**
1. Circular pitch
 2. Module
 3. Backlash
 4. Helix angle
 5. Axial Pitch
 6. Back cone radius
 7. Lead
- (b)** A bronze spur pinion rotating at 600 r.p.m. drives a cast iron spur gear at a transmission ratio of 4:1. The permissible static stresses for the pinion and gear materials are 84 MPa and 105 MPa respectively. The pinion has 16 standard 20° full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the standpoint of strength. Take velocity factor as $3/(3+v)$ and tooth form factor as $0.154 - (0.912/T)$ for the given system. **07**

OR

- Q.5 (a)** Discuss the merits and demerits of rolling contact bearings over sliding contact bearings. **07**
- (b)** Write the procedure for the design of a shaft for bevel gears. **07**
