

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER-V • EXAMINATION – SUMMER • 2014

Subject Code: X 51903**Date: 31-05-2014****Subject Name: Machine Design-I****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)** What is Standardization? What is its importance in machine design? **07**
(b) Explain design consideration of casting. **07**

- Q.2 (a)** Explain with neat sketch importance of Goodman's line in design of mechanical component subjected to fluctuating stresses. **07**
(b) Design a helical compression spring for an engine valve from the following data: **07**
- | | |
|---------------------|-------------------------------------|
| Maximum Load | : 1050 N |
| Minimum Load | : 850 N |
| Lift of valve | : 4 mm |
| Spring Index | : 5 |
| Allowable stress | : 470 N/mm ² |
| Modulus of Rigidity | : 8×10^4 N/mm ² |

OR

- (b)** Explain design procedure of Disc or Plate Clutch. **07**
- Q.3 (a)** Classify the pressure vessels. Explain circumferential or Hoop Stress and longitudinal stress. **07**
(b) A cast iron cylinder of internal diameter 250 mm and thickness 50 mm is subjected to a pressure of 5 N/mm². Calculate the tangential and radial stresses at the inner, middle (radius 125 mm) and outer surfaces. **07**

OR

- Q.3 (a)** Explain the different physical properties of good bearing materials. **07**
(b) A single row angular contact ball bearing number 310 is used for an axial flow compressor. The bearing is to carry a radial load of 2500 N and an axial load of 1500 N. Assuming light shock load (Service factor $K_s = 1.5$), determine the rating life of the bearing. The radial load factor and axial load factor is 1.00 and 0.9. The dynamic load carrying capacity of bearing 310 is 53 KN. **07**
- Q.4 (a)** Classify the wire ropes. How the wire ropes are designated and give their applications. **07**
(b) A belt drive consists of two V-belts in parallel, on grooved pulleys of the same size. The angle of the groove is 30° . The cross-sectional area of each belt is 750 mm² and coefficient of friction is 0.12. The density of the belt material is 1.2 Mg/m³ and the maximum safe stress in the material is 7 MPa. Calculate the power that can be transmitted between pulleys of 300 mm diameter rotating at 1500 rpm. **07**

OR

- Q.4 (a)** A single block brake as shown in figure 4.1, the diameter of the drum is 250 mm and the angle of contact is 90° . If the operating force of 700 N is applied at the end of a lever and the coefficient of friction between drum and lining is 0.35, determine the torque that can be transmitted by the block brake. **07**

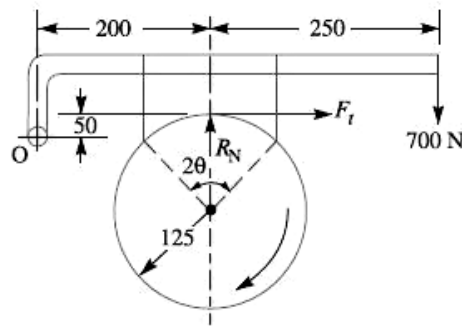


Figure 4.1

- Q.4 (b)** A centrifugal clutch transmitting 20 KW at 750 rpm consists of 4 shoes. The clutch is to be engaged at 500 rpm. The inner radius of the drum is 165 mm while the radius to the centre of gravity of the shoes in engaged position is 140 mm. The coefficient of friction is 0.3. Calculate the mass of each shoe.
- Q.5 (a)** A truck spring has 12 numbers of leaves, two of which are full length leaves. The spring supports are 1.05 m apart and the central band is 85 mm wide. The central load is to be 5.4 kN with a permissible stress of 280 MPa. Determine the thickness and width of the steel spring leaves. The ratio of the total depth to the width of the spring is 3. Also determine the deflection of the spring. **07**
- (b)** Explain with neat sketch phenomenon of Nipping of springs. **07**
- OR**
- Q.5 (a)** A closed vessel is to be designed to withstand an internal pressure of 50 MPa having inside diameter of 450 mm. The properties of the vessel material are yield strength is 300 MPa, ultimate tensile strength is 500 MPa, Poisson's ratio = 0.3. Determine the required wall thickness of the vessel using a factor of safety of 1.5 based on yield strength on the basis of
i) maximum principal stress theory, ii) maximum shear stress theory. **07**
- (b)** What are journal bearings? Give classification of these bearings. **07**
