

**B.TECH SEM – IV (2007 COURSE) (PRODUCTION ENGG.) :**  
**SUMMER - 2018**

**SUBJECT : DESIGN OF MACHINE ELEMENTS**

Day : Tuesday  
Date : 12/06/2018

S-2018-2638

Time : 10.00 AM TO 01.00 PM  
Max. Marks : 80

**N.B.:**

- 1) **Q.No.1 and Q.No.5 are COMPULSORY.** Out of the remaining questions attempt **ANY TWO** questions from each section.
- 2) Answers to both the sections should be written in **SEPARATE** answer books.
- 3) Use of non-programmable **CALCULATOR** is allowed.
- 4) Figures to the right indicate **FULL** marks.
- 5) Assume suitable data if necessary.

**SECTION – I**

- Q.1 a)** What are the different types of stresses induced in rectangular key? **[05]**
- b)** What are the terminology used in design of helical spring? **[05]**
- c)** What are the different types of mechanical brakes? **[04]**
- Q.2** A shaft is supported by two bearings placed 1m apart. A 600 mm diameter pulley is mounted at a distance of 300 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having maximum tension of 2.25 kN. Another pulley 400 mm diameter is placed 200 mm to the left of right hand bearing and is driven with the help of electric motors belt. Which is placed horizontally to the right. The angle of contact for both the pulleys is  $180^\circ$  and  $\mu = 0.24$ . Determine the suitable diameter for a solid shaft allowing working stress of 63 MPa in tension and 42 MPa in shear for the material of shaft. Assume that the torque on arc pulley is equal to that on other pulley. **[13]**
- Q.3** A power screw having double start square threads of 25 mm nominal diameter and 5 mm pitch is acted upon by an axial load of 10 kN. The outer and inner diameters of screw collar are 50 mm and 20 mm respectively. The coefficient of thread friction and collar friction may be assumed is 0.2 and 0.15 respectively. The screw rotates at 12 rpm. Assuming uniform wear condition at the collar and allowable thread bearing pressure of  $5.77 \text{ N/mm}^2$ . Find: **[13]**
- a) Torque required to rotate the screw.
  - b) Stresses in screw.
  - c) Height of nut
- Q.4 a)** What are the factors should be consider while designing friction clutches? **[07]**
- b)** A vehicle of mass 1200 kg is moving down the hill at a slope of 1:5 at 72 km/h. it is to be stopped in a distance of 50m. if the diameter of the tyre is 600 mm determine the average braking torque to be applied to stop the vehicle, neglecting all the frictional energy except of the brake. **[06]**

**P.T.O.**

## SECTION – II

- Q.5 a)** What are the advantages of 'V-belt' drive over 'flat belt' drive? [06]
- b)** What is antifriction bearing? [04]
- c)** What is the use of modified Goodmann diagram? Show it by using neat sketch. [04]
- Q.6** Derive stribeck's equation for the basic static capacity of bearing. State the assumption made [13]
- Q.7** The following data is given for an open type V-belt drive: [13]
- |                             |              |
|-----------------------------|--------------|
| Diameter of driving pulley  | = 50 mm      |
| Diameter of driven pulley   | = 300 mm     |
| Centre distance             | = 1 m        |
| Groove angle                | = $40^\circ$ |
| Mass of belt                | = 0.25 kg/m  |
| Maximum permissible tension | = 750 N      |
| Coefficient of friction     | = 0.2        |
- Calculate the maximum power transmitted by the belt and corresponding belt velocity. Neglect power losses.
- Q.8 a)** Draw a neat sketch of 'Rotating Beam fatigue testing machine'. [04]
- b)** The work cycle of mechanical component subjected to completely reversed bending stresses consists of the following three elements. [09]
- $\pm 350 \text{ N/mm}^2$  for 85% of time.
  - $\pm 400 \text{ N/mm}^2$  for 12% of time.
  - $\pm 500 \text{ N/mm}^2$  for 3% of time.
- The material for component is 50C4 ( $S_{ut} = 600 \text{ N/mm}^2$ ) and the corrected endurance limit of the component is  $280 \text{ N/mm}^2$ . Determine the life of the component.

\* \* \* \*