

**B.Tech. SEM -IV Production 2014 Course (CBCS) : SUMMER - 2019**

**SUBJECT: DESIGN OF MACHINE ELEMENTS**

Day: Thursday  
Date: 30/05/2019

**S-2019-2630**

Time: 10.00 AM TO 01.00 PM  
Max Marks.: 60

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**N.B. :**

- 1) All questions are **COMPULSORY**.
  - 2) Figures to the right indicate **FULL** marks.
  - 3) Assume suitable data, if necessary.
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**Q.1** Explain concept of machine design and general design considerations. **(10)**

**OR**

**Q.1** What is the process of selecting engineering materials for a component by considering functionality, raw material generating process, strength, cost quantity and aesthetics? **(10)**

**Q.2** How the shaft is designed when it is subjected to static loading. **(10)**

**OR**

**Q.2** A hoisting drum of 0.5 m diameter is keyed to a shaft which is supported in two bearings and driven through a reduction gear pair having ratio of 12:1. The gear, having pitch circle diameter of 450 mm is mounted at the end of the shaft such that it overhangs the nearest bearing by 150 mm the load to be hoisted is 8 KN at the speed of 50 m/min. The efficiency of drive is 80%. The shaft is made of steel, for which the working stresses are 115 MPa in tension and 50 MPa in shear. If the combined shock and fatigue factors for bending and torsion are 2 and 1.5 respectively determine:  
i) The power and speed of electric motor  
ii) Diameter of shaft **(10)**

**Q.3** What is the function of brake with neat sketch? **(10)**

A solid cast iron disk 1 m in diameter and 0.2 m thick is used as a flywheel. It is rotating at 350 rpm. It is brought to rest in 1.5 seconds by means of a brake calculate

- i) The energy absorbed by the brake
- ii) The torque capacity of the brake

**OR**

**Q.3** Explain construction and working of centrifugal clutch with neat sketch. **(10)**

A centrifugal clutch transmitting 20kw 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. The radius of the center of gravity of the shoes is 140 mm, when the clutch is engaged. The coefficient of friction is 0.3. While the permissible pressure on friction lining is 0.1 N/mm<sup>2</sup>. Calculate

- i) Mass of each shoes
- ii) Dimensions of friction lining.

**P.T.O.**

**Q.4** What are the functions of bearing? Derive the expression for stribekes equation. (10)

**OR**

**Q.4** Explain load life relationship. (10)  
A toper roller bearing has a dynamic load capacity of 26 KN. The desired life for 90% of the bearings is 8000 h and the speed is 300 rpm calculate the equivalent radial load that the bearing can carry.

**Q.5** Explain eccentric load on circular base in details. (10)

**OR**

**Q.5** Write short note on “torque requirement for bolt tightening”. (10)

**Q.6** A mechanical press is operated by the single start square threaded screw of (10)  
80mm nominal diameter and 10mm pitch. The screw is required to exert a maximum axial force of 10kN. The length of nut is 40 mm, while mean radius of friction collar is 30 mm. The coefficient of friction at the threads and the collar is 0.12. If the mean diameter of the handwheel rim is 500 mm determine

- i) The force required to be applied at the handwheel rim.
- ii) The efficiency of press.
- iii) The bearing pressure at threads.

**OR**

**Q.6** A power screw having double start square threads of 30 mm nominal (10)  
diameter and 5 mm pitch is acted upon by an axial load of 10KN. The outer and inner diameters of screw collar are 50 mm and 30 mm respectively. The coefficient of thread friction and collar frictions may be assumed as 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:

- i) The torque required to rotate the screw.
- ii) The stresses in screw.
- iii) The height of nut.

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