

**6E3049**

Roll No. \_\_\_\_\_

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**6E3049****B.Tech VI Sem. (Main/Back) Exam., April-May, 2012  
Mechanical Engg.****6ME 1 Design of Machine Elements-II  
(Common for ME, AE and P&I)****Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 24***Instructions to Candidates:*

Attempt any **five questions**, selecting one question from **each unit**.  
All Questions carry **equal marks**. Schematic diagrams must be shown  
wherever necessary. Any data you feel missing suitably be assumed  
and stated clearly.

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. \_\_\_\_\_ **Nil** \_\_\_\_\_2. \_\_\_\_\_ **Nil** \_\_\_\_\_

### **UNIT - 1**

1. (a) Explain the following terms used in design of machine members subject to variable loads :

(i) Size factor                      (ii) Notch Sensitivity

(iii) Endurance limit      (iv) Surface finish factor                      12

(b) What information do you obtain from Soderberg diagram ?                      4

Or

1. (a) What do you understand by "Stress concentration"? How do you take it into consideration in case of a component subjected to dynamic loading?                      6

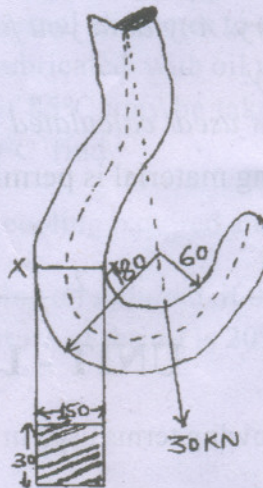
- (b) Determine the diameter of a tensile member of a circular cross section. The following data is given: Maximum tensile load = 20 kN; Maximum compressive load = 10 kN, Ultimate tensile strength = 600 MPa, yield point = 390 MPa, Endurance limit = 290 MPa Factor of safety = 4, Stress concentration factor = 2.2 10

## UNIT - 2

- 2 Explain complete design procedure for screw jack. 16

Or

The crane hook carries a load of 30 kN, as shown in fig. The section at X-X is Rectangular whose horizontal side is 150 mm. Find the stresses in the inner and Outer fibres at the given section. 16



## UNIT - 3

- 3 A helical compression spring made of oil tempered carbon steel, is subjected to a load which varies from 400 N to 1000 N. The spring index is 6 and the design factor of safety is 1.25. If the yield stress in shear is 770 MPa and endurance stress in shear is 350 MPa find :  
 1) size of the spring wire 2) Diameters of the spring 3) No. of turns of the spring and 4) free length of the spring.

The compression of the spring at the maximum load is 30 mm. The modulus of rigidity for the spring material may be taken as 80 kN/mm<sup>2</sup> 16

Or

(a) Explain, with the help of a neat sketch the construction of a roller chain. 8

(c) A flat belt is required to transmit 30 kw from a pulley of 1.6 m effective diameter running at 400 r.p.m. The angle of contact is spread over  $11/24$  of the circumference. The coefficient of friction between the belt and pulley surface is 0.3. Determine taking centrifugal tension into account, width of the belt required. It is given that the belt thickness is 9.8 mm density of its material is  $1300 \text{ kg/m}^3$  and the related permissible working stress is 2.5 MPa. 8

#### UNIT - 4

4 (a) Write the expression for static, limiting wear load and dynamic load for spur gears. 6

(b) A gear drive is required to transmit a maximum power of 32.5 kw. The velocity Ratio is 1:2 and r.p.m of the pinion is 300. The approximate centre distance between the shafts may be taken as 800 mm. The teeth has  $20^\circ$  stub involutes profiles. The static stress for the gear material (which is cast iron) may be taken as 80 MPa and face width as 10 times the module. find the module face width and no. of teeth on each gear.

Check the design for dynamic and wear loads. The deformation or dynamic factor in the Buckingham equation may be taken as 80 and the material combination factor for the wear as 1.4. 10

Or

4 (a) Explain the following terms used for Bevel gears :-

(i) Conedistance (ii) Pitch angle

(iii) Root angle (iv) Face angle

(v) Backing (vi) Crown height 6

- (b) A pair of helical gears consist of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 r.p.m. The normal pressure angle is  $20^\circ$  while the helix angle is  $25^\circ$ . The face width is 40mm and the normal module is 4 mm. The pinion as well as gear are made of steel having ultimate strength of 600 MPa and heat treated to a surface hardness of 300 B.H.N. The service factor and factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for the dynamic load and calculate the power transmitting capacity of the gears. 10

## UNIT - 5

- 5 (a) What is the procedure followed in designing a journal Bearing? 6
- (b) A full journal bearing of 60mm diameter and 110 mm long has a bearing pressure of  $1.6 \text{ N/mm}^2$  -The speed of the journal is 1000 r.p.m and the ratio of journal diameter to the diametral clearance is 1000. The bearing is lubricated with oil whose absolute viscosity at the operating temp of  $85^\circ\text{C}$  may be taken as  $0.012 \text{ kg/ms}$ . The room temperature is  $40^\circ\text{C}$  find :
- (1) The amount of artificial cooling required and
- (2) The mass of the lubricating oil required ,if the difference between the outlet and inlet temperature of the oil is  $20^\circ\text{C}$ . Take specific heat of the oil as  $1950 \text{ J/KG}^\circ\text{C}$  . 10

Or

- 5 (a) Explain different types of antifriction bearings with neat sketches. 8
- (b) Explain how the following factors influence the life of a bearing:
- (i) Temperature (iii) load
- (ii) Speed (iv) Reliability 8