

Roll No.

Total No. of Pages : 02

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B.Tech. (ME) (Sem-5)
DESIGN OF MACHINE ELEMENTS

Subject Code : BTME-502-18

M.Code : 78248

Date of Examination : 21-11-2023

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Explain briefly :

- a) Explain clearly the bearing stress developed at the area of contact between two members.
- b) Define the term endurance limit.
- c) What is the function of clutch in an automobile?
- d) What are commonly used materials for sliding contact bearings?
- e) What are the factors upon which the coefficient of friction between the belt and the pulley depends?
- f) What is creep in belts?
- g) Explain the Module and Pressure angle in terms of gears.
- h) Why it is necessary to dissipate the heat generated when clutches operate?
- i) What are the assumptions made in the design of welded joints?
- j) What is leg and throat thickness of a fillet weld?

SECTION-B

2. A motor drives a machine shaft on which a pulley is mounted. The motor is placed vertically below the pulley having 1500 mm diameter, having belt tensions as 5400 N and 1800 N on the tight side and slack side respectively and are assumed to be vertical. The pulley is 400 mm overhung from the centre line of the bearing. Taking the maximum allowable shear stress as 42 MPa. Calculate the standard diameter of the shaft.
3. Two pulleys, one 450 mm diameter and the other 200 mm diameter, on parallel shafts 1.95 m apart are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min. If the maximum permissible tension in the belt is 1 kN and the coefficient of friction between the belt and pulley is 0.25?
4. Determine the diameter of a circular rod made of ductile material with a fatigue strength (complete stress reversal), $\sigma_c = 265$ MPa and a tensile yield strength of 350 MPa. The member is subjected to a varying axial load from $W_{\min} = -300 \times 10^3$ N to $W_{\max} = 700 \times 10^3$ N and has a stress concentration factor = 1.8. Use factor of safety as 2.0.
5. Explain the procedure used to design a chain drive.
6. What are the different basis on which the gears are classified? Explain in detail.

SECTION-C

7. A solid circular shaft is subjected to a bending moment of 3000 N-m and a torque of 10000 N-m. The shaft is made of 45 C 8 steel having ultimate tensile stress of 700 MPa and a ultimate shear stress of 500 MPa. Assuming a factor of safety as 6, determine the diameter of the shaft.
8. A plate clutch having a single driving plate with contact surfaces on each side is required to transmit 110 kW at 1250 r.p.m. The outer diameter of the contact surfaces is to be 300 mm. The coefficient of friction is 0.4. a) Assuming a uniform pressure of 0.17 N/mm²; determine the inner diameter of the friction surfaces, b) Assuming the same dimensions and the same total axial thrust, determine the maximum torque that can be transmitted and the maximum intensity of pressure when uniform wear conditions have been reached.
9. A spur gear drive is required to transmit a maximum power of 22.5 kW. The velocity ratio is 1:2 and r.p.m. of the pinion is 200. The approximate centre distance between the shafts may be taken as 600 mm. The teeth have 20° stub involutes profiles. The static stress for the gear material (which is cast iron) may be taken as 60 MPa and the face width as 10 times the module. Find the module, face width and number of teeth on each gear.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.