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Total number of pages: [2]

Total number of questions: 06

B. Tech. – ME / 6th Sem.

Design of Machine Elements-II

Subject Code: BTME-601

Paper ID:

Time allowed: 3 Hrs

Max Marks: 60

Important Instructions:

- All questions are compulsory
- Assume any missing data, Design data book is allowed.

Q. 1. Short-Answer Questions:

- (a) How the wire rope is designated?
- (b) What do you mean by endurance strength?
- (c) What are the thermal considerations in the brake design?
- (d) What is herringbone gear?
- (e) Explain what do you understand by A. M. Wahl's factor and state its importance in the design of helical springs?
- (f) What do you mean by velocity factor in spur gear design?
- (g) Explain the advantages of helical gear over spur gear.
- (h) What is the general structure of CAD software?
- (i) Write the advantages and disadvantages of chain drive over rope drive.
- (j) Explain how factor of safety is determined under steady and varying loading?

PART B (5×8marks)

Q. 2. Design a rubber belt to drive a dynamo generating 20 KW at 2250 rpm and CO1 fitted with pulley 200 mm dia. Assume dynamo efficiency to be 85%. Allowable stress for belt material is 2.1 N/mm^2 ; Density of the rubber is 1000 kg/m^3 ; angle of contact 165 degree and coefficient of friction between belt and pulley is 0.3.

OR

A rope is to transmit 250 KW from pulley of 1.2 m diameter, running at a speed of 300 rpm. The angle of lap may be taken as Π radians. The groove half angle is 22.5 degree. The rope diameter is 50mm. The mass of the rope is 1.3 kg per meter length and each rope has a maximum pull of 2.2 KN, coefficient of friction between rope and pulley is 0.3. Determine the no. of rope required. If the overhang of the pulley is 0.5 m, suggest suitable size of the pulley shaft if it is made of steel with a shear stress of 40 N/mm^2 .

- Q. 3. Design a roller chain to transit power from a 20 KW motor to a reciprocating pump. The pump is to operate continuously 24 hrs per day. The speed of the motor is 600 rpm and that of the pump is 200 rpm. Find a) no. of teeth on each sprocket; b) pitch and width of the chain. CO1

OR

A pair of helical gear with 30 degree helix angle is used to transmit 15KW at 10000 rpm of the pinion. The velocity ratio is 4:1. Both the gears are made of hardened steel of static strength 100N/mm^2 . The gears are 20 degree stub and pinion is to have 24 teeth. Face width may be taken as 14 times the module. Find the module and face width from the standpoint of strength and check the gears for wear.

- Q. 4. An 80 mm long bearing supports a load of 2800 N on a 50 mm diameter shaft. The bearing has a radial clearance of 0.05mm and viscosity of the oil is 0.021 Kg/m-s at operating temp. If the bearing is capable of dissipation 80 J/s, determine the maximum safe speed. CO2

OR

A foot step bearing supports a shaft of 150mm diameter which is counter bored at the end with a diameter of 50mm. If the bearing pressure is limited to 80N/mm^2 and the speed is 100 rpm; find 1) the load to be supported 2) power lost in friction and 3) the heat generated at the bearing. Assume coefficient of friction = 0.015.

- Q. 5. A spiral spring is made of a flat strip 6 mm wide and 0.25 mm thick. The length of the trip is 2.5 m. Assume the maximum stress of 800MPa to occur at the point of greatest bending moment, calculate the bending moment, the no. of turns to wind up the spring and the strain energy stored in the spring. Take $E = 200\text{KN/mm}^2$. CO3

OR

An engine developing 45 KW at 1000 rpm is fitted with a cone clutch built inside the flywheel. The cone has face angle 12.5 degree and the maximum mean diameter of 500 mm. The coefficient of friction is 0.2. The normal pressure on the clutch face is not to exceed 0.1N/mm^2 . Determine: 1) the face width required and 2) The axial spring force necessary to engage the clutch.

- Q. 6. In a band and block brake, the band is lined with 14 blocks, each of which subtends an angle of 20 degree at the drum centre. One end of the band is attached to the fulcrum of the brake lever and the other to the pin 150 mm from the fulcrum. Find the force required at the end of the lever 1 m long from the fulcrum to give a torque of 4 KN-m. The dia. of the brake drum is 1 m and the coefficient of friction between the blocks and the drum is 0.25. CO4

OR

An engine developing 45 KW at 1000 rpm is fitted with a cone clutch built inside the flywheel. The cone has face angle 12.5 degree and the maximum mean diameter of 500 mm. The coefficient of friction is 0.2. The normal pressure on the clutch face is not to exceed 0.1N/mm^2 . Determine: 1) the face width required and 2) The axial spring force necessary to engage the clutch.