

16135(J)

B. Tech 6th Semester Examination

Machine Design-II (NS)

ME-324

June-16

Time : 3 Hours

Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

- Note :
- Attempt five questions in all selecting one question each from Sections A, B, C and D. Section E is compulsory and all sub parts are to attempted.
 - Use of Design Data book and non-programmable calculators are allowed.
 - Assume any data, if not specifically mentioned in a question, suitably and with proper justification.

SECTION - A

- What is the difference between hydro-dynamic and hydrostatic lubrication?
 - Discuss the terms Bearing characteristic number and Bearing modulus as applied to journal bearing.
 - A journal bearing is proposed for a centrifugal pump. The diameter of the journal is 0.15 m. load on the bearing is 40kN and its speed is 900 rpm. Complete the design calculations for the bearing. (3+3+14=20)
- What do you interpret from the terms SKF 6210, SKF 6301 and 45BC03?
 - Define the terms rating life and dynamic equivalent load as applicable to rolling contact bearings. [P.T.O.]

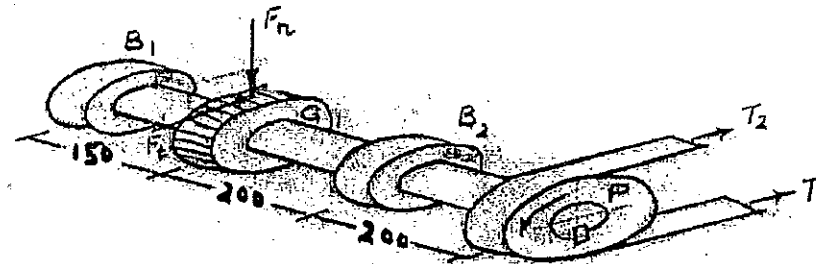
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- (c) A transmission shaft rotating at 870 rpm and transmitting power from pulley P to spur gear G is shown in figure. The belt tensions and the gear tooth forces are

$$T_1=575 \text{ N}, T_2=190 \text{ N}, F_t=630 \text{ N and } F_r=210 \text{ N}$$

The weight of the pulley is 150 N where as weight of the gear is 175 N. The diameter of the shaft at bearings B_1 and B_2 is 15 mm and 20 mm respectively. The load factor is 2.5 and the expected life for 90% of the bearings is 8500 hours. Select single row deep groove ball bearings at B_1 and B_2 . (3+3+14=20)



SECTION - B

- Select a suitable V-belt to transmit 15.5 kW power at 850 r.p.m. from an induction motor to drive a centrifugal pump at approximately 375 rev/min.
 - Select a chain drive to actuate a compressor from a 15 kW electric motor running at 1000 r.p.m., the compressor speed being 350 r.p.m. The minimum centre distance is 500 mm. The compressor operates 16 hours per day. (10+10=20)
- How the steel ropes are classified? Discuss.

- (b) A 15 kW and 1200 r.p.m. motor drives a machine at 300 r.p.m. through a pair of 20° full depth spur gear. The centre to centre distance between the shafts is 450 mm. The drive operates 8 to 10 hours per day under light shock conditions. Select suitable material for the gears and design completely the weaker of the two gears, its shaft and key. Assume gear to be overhanged by a distance of 0.50 meter from the nearest bearing. (6+14=20)

SECTION - C

5. (a) What is surge in a helical spring? How it can be overcome?
- (b) What is buckling in case of helical springs? How it can be avoided?
- (c) A semi elliptical laminated spring is to carry a load of 5500 N and consist of 9 leaves 46 mm wide, two of the leaves being full length. The spring is to be made 1000 mm between the eyes and is held by U-bolts 60 mm apart. Assume that the spring is initially stressed so as to induce an equal stress of 500 N/mm² when fully loaded. Find (i) thickness of leaves (ii) maximum deflection (iii) nip (iv) load on the bolt (v) length of leaves. (3+3+14=20)
6. (a) Draw the figure of a centrifugal clutch and discuss its working.
- (b) A single plate clutch with both sides of the plate effective is required to transmit 25 kW at 1600 r.p.m. The outer diameter of the plate is limited to 300 mm and the intensity of pressure between the plates is not to exceed 0.07 N/mm². Assuming uniform wear and coefficient of friction 0.3, find the inner diameter of the plates and the axial force necessary to engage the clutch. (6+14=20)

[P.T.O.]

SECTION - D

7. Design a cast iron piston for a single acting four stroke engine for the following data:

Cylinder bore = 100 mm; Stroke = 125 mm; Maximum gas pressure = 5 N/mm²; Indicated mean effective pressure = 0.75 N/mm²; Mechanical efficiency = 80%; Fuel consumption = 0.15 kg per brake power per hour; Higher calorific value of fuel = 42x10³ KJ/kg; Speed = 2000 rpm. (20)

8. Design a crane hook with the useful load lifting capacity of the crane as 50 kN. The weight of the hook with grabbing tongs is 10 kN. (20)

SECTION - E

9. (a) What is 'Nipping' in leaf spring? Why it is done?
- (b) Why a lubricant is used? Name four properties of a lubricant.
- (c) Name various types of stresses set up in a belt while in operation.
- (d) Define diametral clearance ratio and eccentric ratio as applicable in sliding contact bearings.
- (e) List atleast four advantages of V-belt drive.
- (f) What do you mean by a 6x37 wire rope? How many wires are in the rope?
- (g) Draw a roller chain for one pitch length and name its various parts.
- (h) Differentiate between a roller bearing and a thrust bearing.
- (i) What do you mean by virtual number of teeth in a helical gear?
- (j) Name various types of gear tooth failure. Discuss any two. (10x2=20)