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10ME62

Sixth Semester B.E. Degree Examination, June/July 2018

Design of Machine Elements – II

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Plot the stress distribution about section A-B of the hook as shown in Fig.Q1(a).

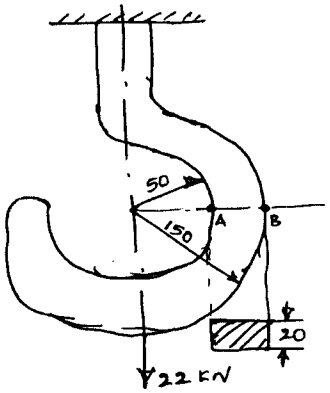

Fig.Q1(a) **(10 Marks)**

b. A carbon steel C50 barrel with diameter 25 mm and 50 mm is to be shrink fitted into another barrel with diameter 50 mm and 75 mm. The tangential stress developed at the inner fiber of the outer barrel due to shrink fitting may be limited to 70 N/mm^2. Determine:
   i) Contact pressure
   ii) Original diameter at contact before shrink fitting
   iii) Resulting stress due to shrink fitting.
   Take E = 21 × 10^4 N/mm^2, V = 0.28. **(10 Marks)**

2 a. Two shafts 1 metre apart are connected by a V-belt to transmit 90 KW at 1200 rpm of a driver pulley of 300 mm effective diameter. The driven pulley rotates at 400 rpm. The angle of groove is 40° and the coefficient of friction between the belt and pulley rim is 0.25. The area of cross section is 400 mm^2 and permissible stress is 2.1 MPa. Density of belt material is 1100 kg/m^3. Calculate the number of belts required and length of belt. **(10 Marks)**

b. A roller chain is to transmit 66.24 KW from a 17 tooth sprocket to a 34 tooth sprocket at a pinion speed of 300 rpm. The loads are moderate shock. The equipment is to run 18 hours/day. Specify the length and size of the chain required for a centre distance about 25 pitches. **(10 Marks)**

3 a. Design a helical compression spring for a maximum load of 1200 N for a deflection of 25 mm. Spring index is 5. Permissible shear stress is 400 MPa and G = 85 GPa. **(10 Marks)**

b. A semi-elliptic leaf spring 1.5 m long is composed of 18 graduated leaves and one full length leaf. The leaves are 60 mm wide and is acted upon by a central load of 30 kN which causes a deflection of 100 mm. Determine the thickness of the leaves and the maximum bending stress in the full length leaf, assuming with and without prestressed and also determine stress in the graduated leaf without prestress. Assume E = 210 GPa. **(10 Marks)**

4 A pair of spur gears having 20° full depth involute system is to transmit 12 KW at 300 rp of the pinion. The allowable static stress for cast iron gear is 60 MPa and for the steel pinio is 105 MPa. Design the gear and check strength for dynamic and wear condition. Assum surface endurance strength as 580 MPa and velocity ratio is 3:1. **(20 Mark**

PART – B

5 Design a worm gear to transmit 40 KW at 1000 rpm of the worm. The desired velocity rat is 25:1. The worm is of hardened steel and the worm wheel is of phosphor bronze havir allowable stress of 75 MPa. **(20 Mark**

6 a. A multi-plate clutch is used to transmit 5 KW power at 1440 rpm. The inner and out diameters of contacting surfaces are 50 mm and 80 mm respectively. The coefficient friction and the average allowable pressure intensity for the lining may be assumed as 0.1 and 350 kPa respectively. Determine:

i) Number of friction plates and pressure plates
ii) Axial force required to transmit power
iii) The actual average pressure
iv) Actual maximum pressure intensity after wear. **(10 Mark**

b. A cast iron flywheel rotating at 600 rpm is brought rest by a brake in 2 sec. the flywheel m be considered as a solid circular disc having a diameter 400 mm and thickness 100 mm. Tl density of cast iron is 7200 kg/m^3. Determine:

i) Energy absorbed by brakes
ii) Number of turns the drum rotates before coming to rest
iii) The braking torque. **(10 Mark**

7 a. Derive the Petroff's equation and state the assumptions. **(10 Mark**

b. A 75 mm long full journal bearing of 75 mm diameter supports a load of 12 kN at the sha speed of 1800 rpm. Assume ratio of diameter to the diametral clearance as 1000. Tl viscosity of oil is 0.01 Pa.S at the operating temperature. Determine:

i) Summerfield number
ii) The coefficient of friction based on McKee equation
iii) Amount of heat generated **(10 Mark**

8 Design a cast iron piston for a single acting four stroke engine for the following data:
Cylinder bore = 100 mm
Stroke = 125 mm
Max gas pressure = 5 N/mm^2
Indicated mean effective pressure = 0.75 N/mm^2
Mechanical efficiency = 80%
Fuel consumption = 0.15 kg per brake power per hour
Higher calorific value of fuel = 42 × 10^3 kJ/kg
Speed = 2000 rpm. **(20 Mark**

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