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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

B.Tech III Year II Semester Regular & Supplementary Examinations October-2020

DESIGN OF MACHINE ELEMENTS-II

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 60

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

- 1 a When do we prefer V-belt over flat belt? List various materials used for flat belts. **4M**
 b A V-belt drive is required for a 15 kW, 1440 rpm electric motor, which drives a centrifugal pump running at 360 rpm for a service of 24 hr/day. From the space considerations, the center distance should be approximately 1 m. Determine: i) Belt specifications ii) Number of belts iii) pulley diameters. **8M**

OR

- 2 a Derive an expression for the radius of neutral axis for rectangular section of curved beam. **6M**
 b A C-frame subjected to a force of 15 kN is shown in Fig.1. It is made of grey cast iron FG 300 and the factor of safety is 2.5. Determine the dimensions of the cross section of the frame. **6M**

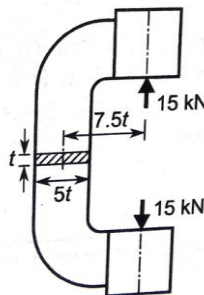


Fig.1

UNIT-II

- 3 a Give merits and demerits of rolling contact bearings over sliding contact bearings. **4M**
 b Select a suitable ball bearing to carry a radial load of 10,000 N and an axial load of 4000 N. The shaft rotates at 1000 rpm. Average life is 5000 hours. Inner race rotates. Take mild shock. **8M**

OR

- 4 Following data is given for 360° hydro dynamic journal bearing. Radial load=3.2 kN, journal speed =1490 rpm, journal diameter =50mm, bearing length=50mm, radial clearance=0.05mm, viscosity of the lubricant=25 cp. Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing Calculate (i) the coefficient of friction (ii) power lost in friction (iii) minimum film thickness (iv) flow requirement in mm³/min. **12M**

UNIT-III

- 5 **a** What is the function of piston? List the main parts of the piston. **3M**
b Design a C.I piston for a single cylinder four stroke diesel engine running at 450 rpm. The other particulars are as follows : **9M**
 Cylinder bore = 240 mm
 Stroke = 300 mm
 Brake mean effective pressure = 0.8 Mpa
 Maximum gas pressure = 5 Mpa
 Fuel consumption = 0.24 kg per kW per hour
 H.C.V. of fuel = 11000 kcal/kg

OR

- 6 Design the I-section of a Connecting rod for a single cylinder IC engine using the following specifications: **12M**
 Diameter of the piston = 100 mm; mass of reciprocating parts = 2.25 kg; stroke length = 125 mm; speed = 500 rpm; maximum explosion pressure = 3.5 N/mm² ; factor of safety = 7 ; density of rod material = 8000 kg/m³; yield stress in compression = 330 Mpa; permissible tensile stress of rod material = 60 Mpa.

UNIT-IV

- 7 **a** Explain briefly the design procedure of leaf springs. **5M**
b 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: i) Size of the spring wire, ii) Diameters of the spring, iii) Number of turns of the spring, and iv) 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/mm². **7M**

OR

- 8 **a** Explain what you understand by A.M. Wahl's factor and state its importance in the design of helical springs. **3M**
b A truck spring has 12 numbers of leaves, two of which are full length leaves. The spring supports are 1.05 m apart and the central band is 85 mm wide. The central load is to be 5.4 kN with a permissible stress of 280 MPa. Determine the thickness and width of the steel spring leaves. The ratio of the total depth to the width of the spring is 3. Also determine the deflection of the spring. **9M**

UNIT-V

- 9 **a** Explain the following terms of gear drive. **4M**
 (i) Module (ii) Pressure angle (iii) Backlash
b Determine the power capacity of a pair of helical gears of module 5. A normal pressure angle is 20°, face width of 7.5 cm and helix angle is 120°. The 18 teeth pinion operates at 1450 RPM and is made up of cast steel and the gear has 108 teeth. **8M**

OR

- 10 **a** Explain different types of gear tooth profiles. **4M**
b A cast steel spur pinion ($\sigma_d = 210$ Mpa) running at 450 rpm transmits 20kW power to a cast iron gear ($\sigma_d = 82$ Mpa) running at 112 rpm. The load is steady. Design the drive and check for dynamic load. **8M**

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