

337611(37)

**BE (6th Semester)
Examination, Nov.-Dec., 2017
(Old Scheme)
Machine Design-II**

Time Allowed : 4 hours

Maximum Marks : 80

Minimum Pass Marks : 28

- Note :**
- (i) Design data book and ISI data sheets are permitted.
 - (ii) Assume suitable design data wherever necessary.
 - (iii) The used design data must be justified with proper reason.
 - (iv) Part (a) of each question is compulsory. Attempt worth 16 marks of each question.
 - (v) The figures in the right-hand margin indicate marks.

Unit-I

1. (a) What is the nipping of leaf spring? [2]
- (b) Design a spring for a rail wagon weighing 20 tonnes, moving with a velocity of 2m/sec. It is to be brought to rest by two buffers with springs of 300 mm diameter. The maximum deflection of the spring is 200 mm. Allowable shear stress in the spring = 60 kgf/mm². [7]

- (c) A semi-elliptical spring 1500 mm long carries a total load of 12 kN. The spring is to have 10 leaves, two being full length leaves. The deflection is to be 60 mm. Design the spring. [7]
- (d) Derive a relation for strain energy stored in circular cross-section rod loaded by pure torsional moment. Hence, calculate the weight of the helical spring made of circular cross-section wire which is required to bring to rest weight of 250N moving with a velocity of 2.75 m/sec. The maximum allowable stress in the spring material is to be 550 N/mm² and $C = 0.84 \times 10^5$ N/mm². If the spring made from wire diameter 7.1 mm with a min coil diameter of 60 mm, calculate the stiffness of the spring and number of coils required. [7]

Unit-II

2. (a) Sketch the profile of spur gear and mark terminology used to specify the gear. [2]
- (b) Design a spur gear drive to transmit 30 kW at 1440 rpm, speed reduction is 2.5 and life of the spur gear is 1000 hours. [14]

OR

Design spur gear to transmit 1.5 kW at 1440 rpm from an electric motor to an air compressor running at 720 rpm. [14]

Unit-III

- 3. (a) Sketch loading pattern for bevel gear working in one direction. [2]
- (b) A pair of helical gears is to transmit 38 kW at 1500 rpm of the pinion. The speed reduction is 5 and the helix angle is 15 degrees. Design the helical gear. [14]

OR

Design a bevel gear drive to transmit 10 kW at 1440 rpm. Gear ratio = 3, life of the gear = 10,000 hrs, Material for pinion and gear = C45. <http://www.csvtuonline.com> [14]

Unit-IV

- 4. (a) Define the following terminology : (solve any one) : [2]
 - (i) Rating life of rolling contact bearing
 - (ii) Viscosity index for lubricants
- (b) A single-row deep groove ball bearing for shaft diameter 45 mm is to be selected. The bearing is to withstand 180 kgf radial load and 45.5 kgf axial load at 1000 rpm. It is desired that the bearing should have a life of 5000 hrs with a failure probability of 6%. Select the bearing for inner ring rotating. [14]

OR

In journal bearing 120 mm diameter and 60 mm long has a diametral clearance of 0.2 mm. The journal rotates at 3000 rpm and it is lubricated with SAE-20 oil of an

average temperature of 70°C. Estimate power loss and frictional torque. The journal bearing is used for steam turbine. [14]

Unit-V

- 5. (a) Write short note on any one : [2]
 - (i) Centrifugal clutch
 - (ii) Adjustment of belt tensions
 - (iii) Specification of wire ropes
 - (iv) V-belt can transmit more power than flat belt
- (b) Design a flat belt drive to transmit 25 kW at 720 rpm to an aluminium rolling machine. The speed reduction of belt drive is 3.0. The distance between the shaft is 3m and diameter of rolling machine pulley is 1.2 m. [7]
- (c) A multiple disc clutch has 6 plates having 5 pairs of active friction surfaces. The intensity of pressure is 0.15 N/mm². The outer and inner radius of surfaces are 135 mm and 80 mm. Coefficient of friction is 0.25. Find the power that can be transmitted at 475 rpm. [7]
- (d) Design a V-belt drive to transmit 50 kW at 1440 rpm from an electric motor to a textile machine running 24 hrs a day. The speed of the machine shaft is 480 rpm. [7]

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