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Question Paper Code : 24674

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2010.

Sixth Semester

Mechanical Engineering

ME 342 — DESIGN OF TRANSMISSION SYSTEM

(Regulation 2001)

Time : Three hours Maximum : 100 marks

(Approved Design Data Book is permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How the bevel gears are classified? Explain with neat sketch.

2. State the usage of worm gears.

3. How does a hoisting chain differ from a roller chain?

4. List the effects of increasing and decreasing the pressure angle in gear design.

5. In what way is the timing belt superior to ordinary belt?

6. State the law of gearing.

7. Classify clutches based on the coupling methods.

8. What is fade?

9. Give the desirable properties of friction material used for the lining of brake shoes.

10. Explain why braking action is not effective when travelling is reverse in automobiles.

PART B — (5 × 16 = 80 marks)

11. (a) A V belt drive is to transmit 50 kW in a heavy duty saw mill which works in two shifts of 8 hours each. The speed of the motor shaft is 1440 rpm with an approximate speed reduction of 2 in the machine shaft. The peripheral speed of the belt should not exceed 24 m/sec. Design the drive. (16)

Or

(b) Select a wire rope for a vertical mine hoist to lift 10,000 kN of coal from a depth of 750 m in each 8 hours shift. Assume a two compartment shaft with hoisting skips in balance. Assume rope velocity 750 m/min, acceleration and declaration periods of each 10 sec. and rest periods of each 10 sec. for discharging and loading. Assume skip weight to be half of that of the load, $E = 8 \times 10^4$ N/mm².

12. (a) Design a flat belt drive to transmit 25 kW at 720 rpm to an aluminium rolling machine the speed reduction being 3.0. The distance between the shaft is 3m. Diameter of rolling machine pulley is 1.2 m.

Or

(b) Design a chain drive to transmit 5.5 kW at 900 rpm of the sprocket pinion. A speed reduction of 2.5 : 1 is desired. The driving motor is mounted on an adjustable base. Assume that the load is steady, the drive is horizontal and the service is 16 hrs a day.

13. (a) Referring to Fig. 1 spur gear A receives 3 kW at 600 rev/min through its shaft and rotates clockwise. Gear B is an idler and gear C is the driven gear. The teeth are 20° full depth. (The pitch circles are shown in Fig. 1). Determine

(i) the torque each shaft must transmit

(ii) the tooth load for which each gear must be designed.

(iii) the force applied to the idler shaft as a result of the gear tooth loads. (16)

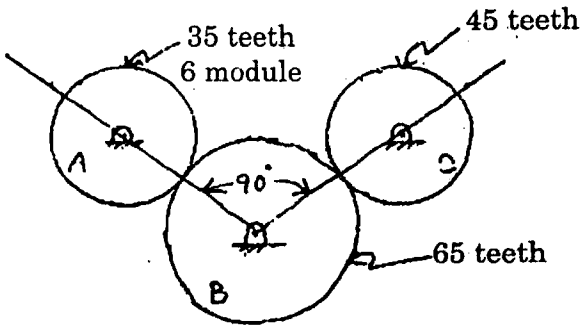

Fig. 1

Or

(b) Design a spur gear pair to transmit 1.5 kW at 1440 rpm from an electric motor to an air compressor running at 720 rpm. Take the working life as 10,000 hrs. Material to be used is cast iron grade 25 for both pinion and wheel.

14. (a) A single plate clutch, effective on both sides, is required to transmit 25 kW at 3000 rpm. Determine the outer and inner diameter of frictional surface if the coefficient of friction is 0.255, ratio of diameters is 1.25 and the maximum pressure is not to exceed 0.1 N/mm^2. Also, determine the axial thrust to be provide by springs. Assume theory of uniform wear. (16)

Or

(b) An engine developing 45 kW at 1000 rpm is fitted with a cone clutch built inside the fly wheel. The cone has a face angle of 12.5° and a maximum mean diameter of 500 mm. The coefficient of friction is 0.2. The normal pressure on the clutch face is not to exceed 0.1 N/mm^2. Determine (i) the face width required (ii) the axial spring force necessary to engage the clutch. (16)

15. (a) A dry single plate clutch is to be designed for an automotive vehicle whose engine is rated to give 100 kW at 2400 r.p.m. and maximum torque 500 N-m. The outer radius of the friction plate is 25% more than the inner radius. The intensity of pressure between the plate is not to exceed 0.07 N/mm^2. The coefficient of friction may be assumed equal to 0.3. The helical springs required by this clutch to provide axial force necessary to engage the clutch are 8. If each spring has stiffness equal to 40 N/mm, determine the dimensions of the friction plate and initial compression in the springs.

Or

(b) A rope drum of an elevator having 650 mm diameter is fitted with a brake drum of 1 m diameter. The brake drum is provided with four cast iron brake shoes each subtending an angle of 45°. The mass of the elevator when loaded is 2000 kg and moves with a speed of 2.5 m/s. The brake has a sufficient capacity to stop the elevator in 2.75 metres. Assuming the coefficient of friction between the brake drum and shoes as 0.2, find (i) width of the shoe, if the allowable pressure on the brake shoe is limited to 0.3 N/mm^2 and (ii) heat generated in stopping the elevator.
