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Question Paper Code : 31043

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Sixth Semester

Mechanical Engineering

080120034 – DESIGN OF TRANSMISSION SYSTEMS

(Regulation 2008)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Name four important elements in a chain.

2.   Write down the disadvantages of flat belt drives.

3.   What are the standard interchangeable tooth profiles?

4.   List out the various methods of manufacturing gears.

5.   Define the term Normal Pitch in a worm gear.

6.   What is difference between bevel gear formation and other type of gears?

7.   List four applications where constant mesh gear box is used.

8.   What are the conditions required for interchangeability in toothed gears?

9.   What is meant by a self-energizing brake?

10. What are the effects of temperature rise in clutches?

PART B — (5 × 16 = 80 marks)

11. (a) A V belt drive is to be arranged between two shafts with 1.2 m as centre distance. The driving pulley is of 250 mm effective diameter and is to be supplied with 20 kW power at 960 rpm. The follower pulley is to run at 460 rpm. Determine the number of belts required from the following: (16)

Arc of the belt cross section = 143 mm²

Mass density of the belt material = 1000 kg/m³

Permissible tensile stress = 2 N/mm²

Co-efficient of friction = 0.30

Groove angle of the pulley = 40°.

Or

(b) A V-belt drive is to transmit 15 kW to a compressor. The motor runs at 1150 rpm and the compressor is to run at 400 rpm. Determine   (16)

   (i) Belt Specification

   (ii) Number of belts

   (iii) Correct centre distance and

   (iv) Drive pulley diameters.

12. (a) Design a straight spur gear drive to transmit 8 kW. The pinion speed is 720 rpm and the speed ratio is 2. Both the gears are made of the same surface hardened carbon steel with 55 RC and core hardness less than 350 BHN. Ultimate strength is 720 N/mm² and yield Strength is 360 N/mm².   (16)

Or

   (b) Design a general purpose enclosed gear train is based on parallel helical gears, specified life is 36,000 hours. Torque at driven shaft is 411 Nm. Driving shaft speed is 475 rpm. Velocity ratio is 4. It is desired to have standard centre distance.   (16)

13. (a) Design a pair of right angled bevel gears to transmit 15 kW at 750 rpm to another gear to run at 250 rpm. Not less than 20 teeth are to be used on either gear. The pressure angle is 20°. Assume a gear life of 12000 hrs.   (16)

Or

   (b) Complete the design of a worm gear speed reducer unit which consists of a hardened steel worm and phosphor bronze gear. The centre distance is 200 mm and transmission ratio is 10:1.   (16)

14. (a) Design a four speed gear box to have following speed ratio. First gear is 5:1 second gear is 3:1, third gear is 1.5:1 and the top gear is 1:1. The centre distance between the input and the output shafts is 150 mm. All gears are 4 mm module. Determine the number of gears of all wheels, pitch circle diameter of all wheels and sketch the diagrammatic arrangement of the gear box. (Assume number of teeth not less than 20 and pressure angle 20°)   (16)

Or

   (b) (i) A three speed gear box has ratios 4:1, 2:1 and 1:1. The centre distance between the shafts is 100 mm. The pressure angle on all gears is 20°. The number of teeth on gear is not less than 20. If the power input is 50 HP at 2000 rpm, determine the maximum horizontal force on the lay shaft by the gears and the greatest torque reaction on the casing.   (12)

   (ii) Write down the guidelines for designing a gear box.   (4)

15. (a) A square threaded bolt of 25 mm nominal diameter and 5 mm pitch is tightened by screwing a nut, whose mean diameter of the bearing surface is 35 mm. If the coefficient of friction for the nut and bolt is 0.12, and for the nut and bearing surface is 0.15, determine the force required at the end of a 250mm long spanner, when the load on the bolt is 12 kN.   (16)

Or

(b) Determine the number of discs required and the maximum intensity of pressure developed considering a multiple plate clutch with both sides being effective. The clutch transmits 25 kW at 600 rpm. An axial load of 500 N is applied. The inner and outer radii of the clutch discs are 80 mm and 180 mm respectively. The effective coefficient of friction is 0.3. Assume uniform wear condition.   (16)

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