Register Number: ……

B.E. DEGREE EXAMINATIONS: APRIL/MAY 2012

Sixth Semester

MECHANICAL ENGINEERING

MEC117: Design of Transmission Systems

(Use of approved design data book is permitted)

Time: Three Hours **Maximum Marks: 100**

Answer All Questions:-

PART A (10 x 1 = 10 Marks)

1. In a horizontal flat belt drive, it is customary to use

   (A) bottom side of the belt as slack side (B) top side of the belt as slack side

   (C) crossed-belting (D) idler in between

2. Which one of the following is a positive drive?

   (A) crossed flat belt drive (B) rope drive (C) V – belt drive (D) chain drive

3. The part of tooth between the pitch circle and dedundum circle is called

   (A) half tooth (B) flank (C) face (D) upper tooth

4. The helix angle for double helical gears may be made up to

   (A) 45° (B) 60° (C) 75° (D) 90°

5. Compared to spur gears, helical gears

   (A) run more smoothly (B) run with more vibration

   (C) consume more power (D) consume less power

6. Miter gears are

   (A) right angled bevel gears having same number of teeth

   (B) spur gears of equal diameter and pitch

   (C) helical gears of same module

   (D) a kind of worm wheel and gear

7. For proper meshing of worm and worm wheel, normal pitch of worm compared to normal pitch of worm wheel should be

   (A) more (B) less (C) equal (D) depends on module

8. For high speed engines, the cam follower should move with

   (A) uniform velocity (B) simple harmonic motion

   (C) uniform acceleration and retardation (D) cycloidal motion

9. A jaw clutch is essentially a

   (A) positive action clutch (B) cone clutch (C) friction clutch (D) disc clutch

10. In order to prevent the brake arm from grabbing, the moment of friction force about the brake arm pivot point should be

(A) less than the total braking effort (B) equal to the total braking effort

(C) greater than the total braking effort (D) zero

PART B (10 x 2 = 20 Marks)

11. How are V-belts specified?
12. What is chordal action in chain drives?
13. Define module.
14. What are the materials used for gear manufacturing?
15. What is backlash?
16. State the purpose of bevel gear drives.
17. List any two methods used for changing speeds in gear boxes.
18. What is kinematic layout?
19. Write short notes on self-locking brake?
20. Name few commonly used friction materials.

PART C (5 x 14 = 70 Marks)

21. a) Two shafts whose centres are 1m apart are connected by a V-belt drive. The driving pulley is supplied with 100 kW and has effective diameter of 300 mm. It runs at 1000 rpm while the driven pulley runs at 375 rpm. The angle of groove on the pulleys is 40^0. The permissible tension in 400 mm^2 cross sectional area of belt is 2.1 MPa. The density of the belt is 1100 kg/m^3. Taking coefficient of friction as 0.28, estimate the number of belts required. Also calculate the length required of each belt.

(OR)

b) Design a wire rope for an elevator in a building 60 m high and for a total load of 20 kN. The speed of the elevator is 4 m/sec and the full speed is reached in 10 sec.

22. a) Design a spur gear drive to transmit 22.5kW at 900rpm. Speed reduction is 2.5. Select suitable gear materials. Take pressure angle of 20^0 and working life of the gears as 10000hrs.

(OR)

b) Design a pair of helical gears to transmit to 10kW at 1000rpm of the pinion. Reduction ratio of 5 is required. Give details of the drive in a tabular form.

23. a) Design a straight bevel gear drive between two shafts at right angles to each other. Speed of the pinion shaft is 360 rpm and the speed of the gear wheel shaft is 120 rpm. Pinion is of steel and wheel of cast iron. Each gear is expected to work for 2 hours/day for 7 years. The drive transmits 7.5 kW.

(OR)

b) The input to worm gear shaft is 18kW and 600rpm. Speed ratio is 20. The worm is to be of hardened steel and the wheel is made of chilled phosphor bronze. Considering wear and strength, design worm and worm wheel.

24. a) Design a 12 speed gear box for an all geared headstock of a lathe. Maximum and minimum speeds are 900rpm and 23rpm respectively. The drive is from an electric motor giving 3 kW at 1200 rpm. Sketch the layout of the gear box and calculate the number of teeth on the gears. Also determine the centre distance between the stage shafts.

(OR)

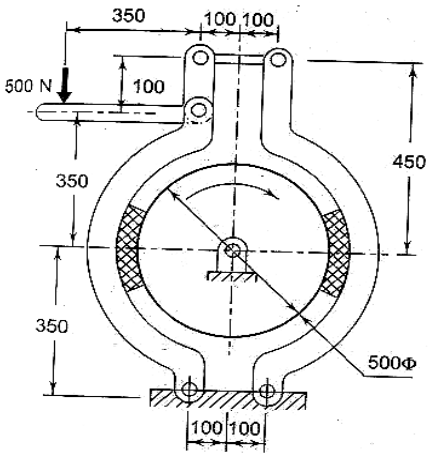
b) A 14 speed gear box is required to furnish output speeds in the range of 125 rpm to 2500 rpm. Draw the speed diagram and the kinematic arrangement.

25. a) A multi-disc clutch has three discs on the driving shaft and two on the driven shaft is to be designed for a machine tool, driven by an electric motor of 17 kW running at 1440 rpm. The inside diameter of the contact surface is 130 mm. The maximum pressure between the surfaces is limited to 0.1 MPa. Design the clutch. Take coefficient of friction as 0.3.

(OR)

b) A double block brake is shown in Fig.1. The brake drum rotates in clockwise direction and the actuating force is 500N. The coefficient of friction between the blocks and the drum is 0.35. Calculate the torque absorbing capacity of the brake.

Fig.1



All dimensions are in mm

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