Register Number: ……

B.E., DEGREE EXAMINATIONS: APRIL/MAY 2013

Sixth semester

MECHANICAL ENGINEERING

MEC117: Design of Transmission System

Usage of PSG Design Data Book is Permitted

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The efficiency of the v-belt is …….than that of the flat belt.
   a) Lower b) greater
   c) Equal d) none of these
2. The maximum velocity ratio that can be obtained in v-belt is
   a) up to 10 b) from 10-20
   c) more than 20 d) none of these
3. The radial force direction is towards the
   a) centre of a gear b) tangent to a gear
   c) edges of a gear d) parallel to the gear
4. The teeth which is straight and parallel to the axis of wheel is
   a) spur gear b) straight gear
   c) helical gear d) herringbone gear
5. The angle made by pitch line of a gear with the gear axis is
   a) root angle b) pitch cone radius
   c) face angle d) pitch angle
6. The angle between the tangent to the pitch helix and the plane of rotation is
   a) pressure angle b) helix angle
   c) lead angle d) pitch angle
7. If the engagement of two different sets of gears are provided, then the gear box is
   a) overlapping speed gear box b) head stock gear box
   c) machine tool gear box d) nine-speed gear box
8. The graphical representation of drive arrangement is
   a) kinematics layout b) ray-diagram
   c) Structural formula d) Procedure

9. Which represents the steepness of cam profile

a) pressure angle b) pitch angle

c) Follower d) design of cam

10. A brake commonly used in railway wagons is

a) shoe brake b) band brake

c) band and block brake d) internal expanding brake

PART B (10 x 2 = 20 Marks)

11. How the wire rope is specified?
12. Explain the term “Crowing of pulley”.
13. What factors influence backlash in gear drives?
14. What are the commonly used gear tooth profiles?
15. How the helical gears are classified?
16. What are the types of worms?
17. List six standard speed starting from 18r.p.m. with a step ratio 1.4
18. Explain ray diagram.
19. Name four profiles normally used in cams.
20. What you meant by self-energizing brake?

PART C (5 x 14 = 70 Marks)

21. a) Select a flat belt drive to mill at 250 r.p.m from 10 kW, 730 rpm motor. Center distance is to be at 2 m. The mill shaft pulley is of 1 m diameter.

(OR)

b) Design a V belt drive to the following specifications.

P = 75 kW

N_1 = 1440 r.p.m

N_2 = 400 r.p.m

d_1= 300 mm

C = 2500 mm

service = 16 hours/ day

22. a) A reciprocating compressor is to be connected to an electric motor with the help of spur gears. The distance between the shafts is to be 50 mm. The speed of the electric motor is 900 r.p.m. and the speed of the compressor shaft is desired to be 200 r.p.m. The torque, to be transmitted is 5000 N-m. Taking starting torque as 25% more than the normal torque, determine:

(i) Module and face width of the gears using 20 degrees stub teeth.

(ii) Number of teeth and pitch circle diameter of each gear. Assume suitable values of velocity factor and Lewis factor.

(OR)

b) A helical gear speed up drive required to drive a centrifugal compressor running at 3000 r.p.m. The helical gear speed up unit is driven by an electric motor running at 1000 r.p.m. The compressor requires a nominal input power of 12.5 kW. The helix angle of 25^o may be assumed for the gears. Standard involute profile 20^o full depth system will be used for the gear teeth. The gear pair is required to last for atleast 10,000 hrs. Design the gear drive.

23. a) A pair of bevel gears is to be used to be used to transmit 10 kW from a pinion rotating at 420 r.p.m. to a gear mounted on a shaft which intersects the pinion shaft at an angle of 70^o. Assuming that the pinion is to have an outside pitch diameter of 180 mm, a pressure angle of 20^o, a face width of 45 mm, and the gear shaft is to rotate at 140 r.p.m., determine

(i) the pitch angle for the gears

(ii) the forces on the pinion and gear

(iii) the torque produced about the shaft axis.

(OR)

b) Design 20^o involute worm gear to transmit 10KW with worm rotating at 140 r.p.m. and to obtain a speed reduction of 12:1.The distance between the shaft is 225mm.

24. a) A gear box is to be designed to provide 12 output speeds ranging from 160 to 2000 r.p.m. The input speed of motor is 1600 r.p.m. Choosing a standard speed ratio, construct the speed diagram and the kinematic arrangement.

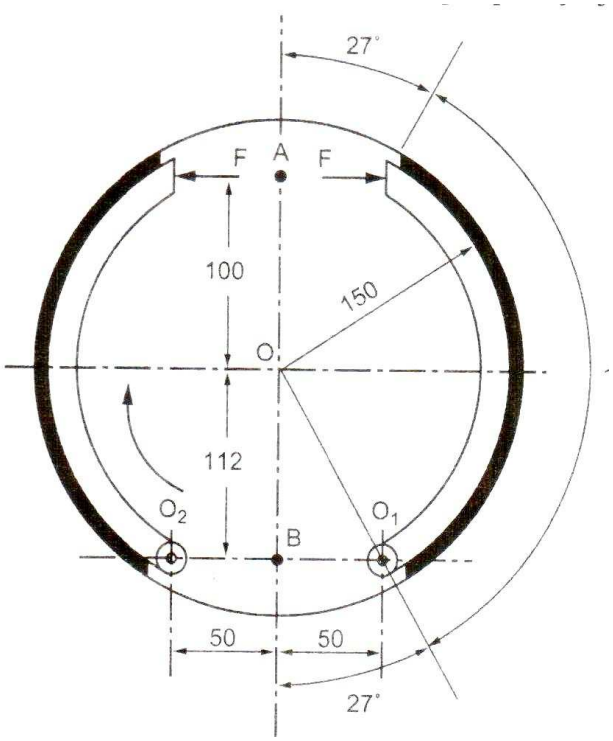
(OR)

b) Sketch the speed diagram and the kinematic layout for an 18 speed gear box for the following data:
Motor speed = 1440 r.p.m. ; minimum output speed = 16 r.p.m. ; maximum output speed = 800 r.p.m ; arrangement = 2x3x3. List the speeds of all the shafts when the output speed is 16 r.p.m.

25. a) An automotive type internal expanding double- shoe shown in fig. is 300 mm in diameter and is actuated by a mechanism that exerts the same force F on each shoe. The shoes are identical and have a face width of 32 mm. The lining is a moulded asbestos having a coefficient of friction of 0.32 and a pressure limitation of 1000 kPa.

(i). Determine the actuating force F

(ii) Find the braking capacity (i.e., torque absorbing capacity of the brake).



(OR)

b) A single plate clutch, effective on both sides, is required to transmit 25 KW at 3000 r.p.m. Determine the outer and inner diameters of frictional surface if the coefficient of friction is 0.225, ratio of diameters is 1.25 and the maximum pressure is not to exceed 0.1N/mm².Also,determine the axial thrust to be provided by springs. Assume the theory of uniform wear

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