Reg. No. : | | | | | | | |

B.E DEGREE END SEMESTER EXAMINATION, APRIL/MAY 2017
SIXTH SEMESTER
ME309 – DESIGN OF TRANSMISSION SYSTEM
Mechanical Engineering
(Regulation 2013)
(Approved Design Data Book is permitted to use in the examination
Any missing data can be suitably assumed)

TIME: THREE HOURS   **MAXIMUM MARKS: 100**
ANSWER ALL QUESTIONS

PART A –– (10 x 1 = 10 Marks)

1. **Crowning of a pulley is done to**

    (a) Prevent the slipping of a belt   (b) To increase the tension of a belt

    (c) To increase the angle of contact   (d) To decrease the tension of a belt

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

    (a) open belt drive   (b) cross belt drive

    (c) wire rope   (d) chain drive

3. **Which of the following is a form of teeth?**

    (a) Cycloidal   (b) Spherical

    (c) Helical   (d) All of the above

4. **The point of contact of two pitch circles of mating gears is called**

    (a) Pressure point   (b) Pitch point

    (c) Module   (d) Contact point

5. **The gear used to convert rotary motion into translating motion is**

    (a) Worm and wheel   (b) Crown gear

    (c) Rack and pinion   (d) Spiral Bevel gear

6. **A hypoid gear is used with _____ shafting.**

(a) parallel

(b) intersecting

(c) nonintersecting

(d) Non-Parallel

7. **The Structural Formula for 14 Speed Gear box**

(a) 3(1) 3(3) 2(5)

(b) 3(1) 3(3) 2(6)

(c) 3(1) 3(3) 2(7)

(d) 3(1) 3(3) 2(8)

8. **A brake commonly used in motor cars is**

(a) shoe brake

(b) band brake

(c) band and block brake

(d) internal expanding brake

9. **When the frictional force helps to apply the brake, then the brake is said to be**

(a) Self-energizing brake

(b) Self-locking brake

(c) Self Hanging brake

(d) Self Power Brake

10. **Jaw clutch is essentially a**

(a) positive action clutch

(b) cone clutch

(c) friction clutch

(d) disc clutch

PART B –– (10 x 2 = 20 Marks)

11. **Why are belt drives called as flexible drives?**

12. **Write any four applications of rope drive?**

13. **State the law of gearing.**

14. **What is backlash in gears?**

15. **Under what situation, worm gears are used?**

16. **List the forces acting on a bevel gear?**

17. **Differentiate ray diagram and structural diagram.**

18. **What is step ratio? Name the series in which speeds of multi-speed gear box are arranged.**

19. **Classify the mechanical brakes.**

20.   Define internal expanding brake.

PART C –– (5 x 14 = 70 Marks)

21. (a)   Design a V-belt drive for the following specification   (14)
       Power to be transmitted   = 75kW
       Speed of the driving wheel   = 1440rpm
       Speed of the driven wheel   = 400rpm
       Diameter of the driving wheel   = 300mm
       Centre distance   = 2500mm
       Service   = 16 hrs / day
                                        (OR)

   (b)   Design a chain drive to actuate a compressor from 10kW electric motor   (14)
       at   960rpm. The compressor speed is to be 350rpm. Minimum center
       distance should be 0.5m. Motor is mounted on an auxiliary bed.
       Compressor is to work for 8 hrs/day.

22. (a)   Design a spur gear drive to transmit 22kW at 900rpm. Speed reduction is   (14)
       2.5. Materials for pinion and wheel are C15 steel and cast iron grade 30
       respectively. Assume pressure angle as 20° and working life of the gears
       as 10,000 hrs.
                                        (OR)

   (b)   Design a pair of helical gear to transmit 37.5kW at 1750rpm of the   (14)
       pinion. The drive is subjected to heavy shock loading. The speed
       reduction is 4 and the helix angle is 15°. Select suitable material and
       design the gear. Check for working stresses and sketch the drive.

23. (a)   A pair of 20^0 full depth involute teeth bevel gears is to be designed to   (14)
       connect two shafts at right angles having velocity ratio 4:1. The gear is
       made of cast steel and pinion is made of C40 material. The pinion
       transmits 40kW at 720rpm. Design the gear completely. Expected gear
       life is 10,000 hrs.
                                        (OR)

   (b)   Design a worm gear drive to transmit 22.5kW at a worm speed of   (14)
       1440rpm. Velocity ratio is 24:1. An efficiency of at least 85% is desired.
       The temperature rise should be restricted to 40°C. Determine the
       required cooling area.

24. (a)   A nine speed gear box, used as a head stock gear box for a turret lathe, is   (14)
       to provide a speed range of 180rpm to 1800rpm. Using Standard step
       ratio draw the speed diagram and kinematic layout. Calculate the number
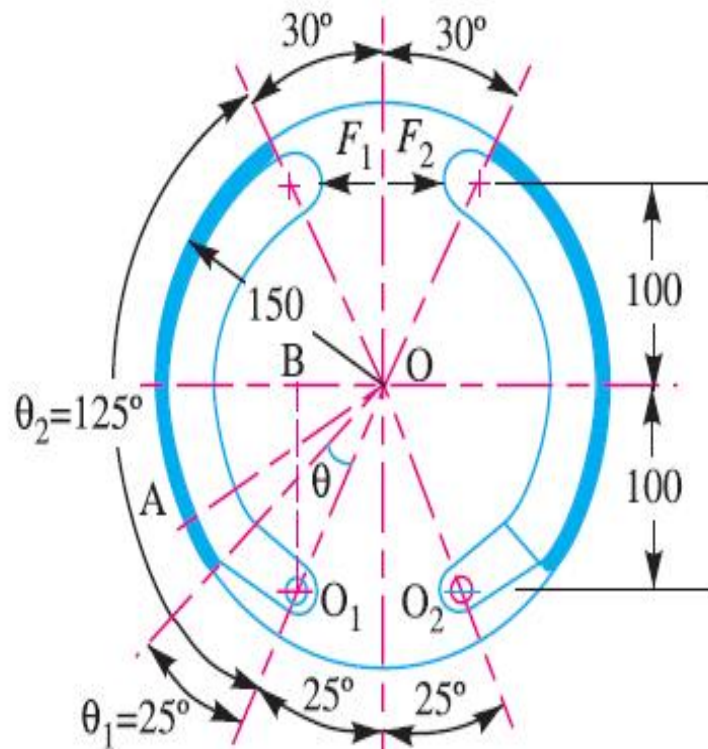   of teeth in each gear wheel.
                                        (OR)

(b) In a milling machine, 18 different speeds in the range of 35rpm and 650rpm are required. Design a three stage gear box with a standard step ratio. Sketch the layout of the gear box, indicating the number of teeth 'z' on each gear. The gear box receives 3.6kW from an electric motor running at 1,440rpm. Sketch also the speed diagram. **(14)**

25. (a) A multiple disc clutch, steel on bronze, is to transmit 4.5kW at 750rpm. The inner radius of the contact is 40mm and outer radius of the contact is 70mm. The clutch operates in oil with an expected coefficient of 0.1. The average allowable pressure is 0.35 N/mm². Find (i) the total number of steel and bronze discs; (ii) the actual axial force required; (iii) the actual average pressure; and (iv) the actual maximum pressure. **(14)**

(OR)

(b) Fig shows the arrangement of two brake shoes which act on the internal surface of a cylindrical brake drum. The braking force F_1 and F_2 are applied as shown and each shoe pivots on its fulcrum O_1 and O_2. The width of the brake lining is 35mm. The intensity of pressure at any point A is 0.4N/mm², where θ is measured as shown from either pivot. The coefficient of friction is 0.4. Determine the braking torque and the magnitude of the forces F_1 and F_2. **(14)**

All dimensions in mm.