B.E. DEGREE EXAMINATIONS: NOV / DEC 2010

Sixth Semester

MECHANICAL ENGINEERING

U07ME601: Design of Transmission Systems

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

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. Selection of Belt drive based on

   A) Power to be transmitted   B) Temperature   C) Motor Speed   D) Shaft diameter

2. Torque transmitted by the shaft

   A) $T = (2\pi N) / 60$ B) $T = (PN60) / 2\pi$ C) $T = 60P / (2\pi N)$ D) $T = 60P / 2\pi$

3. The radial distance of the tooth from the pitch circle to the top of the tooth in a spur gear

   is called

   A) Clearance   B) Addendum   C) Deddendum   D) Working depth

4. To get safe design, beam strength (Fs) and the dynamic load (F_d) should have a relation

   A) $Fs < F_d$ B) $Fs = F_d$ C) $Fs \# F_d$ D) $Fs > F_d$

5. Bevel gears are commonly used in

   A) Carburettor   B) Differential unit   C) Air compressor   D) IC engine

6. In Bevel Gear, the diameter of the largest pitch circle is

   A) Addendum   B) Deddendum   C) Pitch cone   D) Pitch Diameter

7. ………………. is required wherever the variable spindle is necessary.

   A) Shafts   B) Coupling   C) Gear Box   D) Piston

8. In gear box H.P. is called by

   A) Hydraulic & Pneumatic   B) High Pressure   C) High Power   D) Harmonic Progression

9. ……………… is a mechanical device which is used to connect or disconnect the source

   of power at the operation with

   A) Clutch   B) Shaft   C) Belt   D) Engine

10. …………….. connects a moving member to a stationery member.

    A) Clutch   B) Shaft   C) Brake   D) Spindle

PART B (10 x 2 = 20 Marks)

11. Name the four types of belts used for transmission of power.

12. What are the advantages of wire ropes when compared with chains and fibre ropes?

13. List out the various methods of manufacturing a gear.

14. Differentiate double helical and herringbone gears.

15. Differentiate a straight bevel gear and a spiral bevel gear.

16. What are the various losses in the worm gear?

17. What is step ratio?

18. What does the ray diagram of gear box indicates?

19. What is the function of a clutch?

20. Differentiate a brake and a clutch.

PART C (5 x 14 = 70 Marks)

21. a) A leather belt 9 mm × 250 mm is used to drive a cast iron pulley 900 mm in diameter at 336 r.p.m. If the active arc on the smaller pulley is 120^0 and the stress in tight side is 2 MPa, find the power capacity of the belt. The density of leather may be taken as 980 kg / m^3, and the coefficient of friction of leather on cast iron is 0.35.

(OR)

b) Design a chain drive to actuate a compressor from 15 kW electric motor running at 1000 r.p.m., the compressor speed being 350 r.p.m. The minimum centre distance is 500 mm. The compressor operates 16 hours per day. The chain tension may be adjusted by shifting the motor on slides.

22. a) Design a spur gear drive required to transmit 45 kW at a pinion speed of 800 r.p.m. The velocity ratio is 3.5:1. The teeth are 20^0 full depth involute with 18 teeth on the pinion. Both the pinion and gear are made of steel with a maximum safe static stress of 180 N / mm^2. Assume medium shock condition.

(OR)

b) Design a helical gear to transmit 15 kW at 1440 r.p.m. to the following specifications: Speed reduction is 3; Pressure angle is 20^0; Helix angle is 15^0; The material of both gear is C45 Steel. Allowable static stress 180 N/ mm^2; Young's modulus of the material $= 2 \times 10^5$ N/ mm^2.

23. a) Design a straight bevel gear drive between two shafts at a right angle to each other. Speed of the pinion shaft is 360 r.p.m. and the gear wheel shaft is 120 r.p.m. Pinion is of steel and wheel of cast iron. Each gear is expected to work 2 Hours / day for 10 Years. The drive transmits 9.37 kW.

(OR)

b) A hardened steel worm rotates at 1440 r.p.m. and transmits 12 kW to a phosphor bronze gear. The speed of the worm wheel should be 60 ± 3 % r.p.m. Design the worm gear drive if an efficiency of atleast 82 % is desired.

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) A nine speed gear box used as a head stock gear box of a turret lathe, is to provide a speed range of 180 r.p.m. to 1800 r.p.m. Using standard step ratio, draw the speed diagram, an the kinematic layout. Also find and fix the number of teeth on all gears.

25. a) A multiple disc clutch, steel on bronze, is to transmit 4.5 kW at 750 r.p.m. The inner radius of the contact is 40 mm and outer of the contact is 70 mm. The clutch operates in oil with an expected co efficient of 0.1. The average allowable pressure is 0.35 N/mm^2. Find: 1. the total number of steel and bronze discs; 2. the actual axial force required; 3. the actual average pressure.

(OR)

b) A simple band brake is operated by a lever of length 500 mm long. The brake drum has a diameter of 500 mm and the brake band embraces 5 / 8 of the circumference. One end of the band is attached to the fulcrum of the lever while the other is attached to a pin on the lever 100 mm from the fulcrum. If the effort applied to the end of the lever is 2000 N and the coefficient of friction is 0.25, then design the simple band brake.

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