KUMARAGURU
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Register Number:……..

B.E DEGREE EXAMINATIONS: NOV / DEC 2014

(Regulation 2009)

Sixth Semester

MECHANICAL ENGINEERING

MEC117**:** Design of Transmission Systems

(Approved design data book is permitted)

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The included angle for the *V*-belt is usually

   a) 20° – 30° b) 30° – 40°

   c) 40° – 60° d) 60° – 80°

2. The variation in chain speed is due to

   a) Chordal action b) Creep

   c) slip d) backlash

3. The contact ratio for gears is

   a) zero b) less than one

   c) greater than one d) one

4. In helical gears, the distance between similar faces of adjacent teeth along a helix on the pitch cylinders normal to the teeth, is called

   a) normal pitch b) axial pitch

   c) diametral pitch d) module

5. If *b* denotes the face width and L denotes the cone distance, then the bevel factor is written as

   a) b / L b) $b / 2L$

   c) $1 – 2\ b.L$ d) $1 – b / L$

6. The main advantage of worm gear drive is

   a) Ease of manufacturing b) High velocity ratio

   c) Low power loss d) Low cost

7. An automobile gear box has a

a) Simple gear train b) Compound gear train

c) Epicyclic gear train d) Reverted gear train

8. In geometric progression the speed loss is

a) Maximum b) Minimum

c) Average d) intermediate

9. The friction material of the clutch should have

a) High coefficient of friction b) Low coefficient of friction

c) High surface hardness d) High endurance limit.

10. The brake used in most of the automobile vehicle is

a) Shoe brake b) Block brake

c) Band brake d) Internal expanding shoe brake

PART B (10 x 2 = 20 Marks)

11. What are the important factors upon which the selection of belt drive depends?
12. Give the classification of chains.
13. What is meant by arc of contact?
14. What are the forces acting on the helical gears?
15. What is bevel gear?
16. What are the merits and demerits of worm gear drive?
17. Give the general structural formula for the different speeds of gear box.
18. Define ray diagram.
19. Name the two theories applied for the design of friction clutches?
20. Give few characteristics of brake materials.

PART C (5 x 14 = 70 Marks)

21. a) A centrifugal pump running at 340 rpm is to be driven by a 100 KW motor running at 1440 r.p.m, The drive is to work for at least 20 hours every day. The Centre distance between the motor shaft and the pump shaft is 1200 mm. suggest a suitable multiple v-belt drive for this application. Also calculate the actual belt tensions and stress induced.

(OR)

b) Design a chain drive to actuate a compressor from 15kW electric motor running

at 1,000 r.p.m, the compressor speed being 350 rpm. The minimum Centre distance is 500 mm. the compressor operates 15 hours per day. The chain tension may be adjusted by shifting the motor.

22. a) Design a spur gear drive to transmit 22.5 kw at 900 r.p.m. Speed reduction is 2.5. Materials for pinion and wheel are C 15 steel and cast iron grade 30 respectively. Take pressure angle of 20°and working life of the gears are 10,000 hrs.

(OR)

b) A helical gear speed up drive is required to drive a centrifugal compressor running at 300 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°may be assumed for the gears. Standard involute profile of 20°full depth system will be used for the gear drive. The gear pair is required to last for at least 10,000 hrs. design the gear drive for the following gear materials:
Pinion: Heat treated cast steel; Gear: High grade cast-iron.

23. a) Design a pair of bevel gears to transmit 10 KW at a pinion speed of 1440 r.p.m. Required transmission ratio is 4. Material for gear is 15 Ni 2 Cr 1 Mo 15/steel. The tooth profiles of the gears are 20° composite form.

(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 at least 82% is desired.

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

(OR)

b) The spindle of a pillar drilling is to run at 12 different speeds in the range of 100

rpm & 355 rpm. Design a three stage gear box with a standard step ratio. Sketch the layout of the gearbox, indicating the number of teeth on each gear. The gear box receives 5 KW from an electric motor running at 360 rpm. Sketch also the speed diagram.

25. a) 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 0.255, ratio of diameters is 1.25 and the maximum pressure is not to exceed 0.1 N/mm2. Also, determine the axial thrust to be provided by springs. Assume the theory of uniform wear.

(OR)

b) A rope drum of an elevator having 650 mm diameter is fitted with a brake drum of 1m diameter. The brake drum is providing with four cast iron brake shoes each subtending an angle of 45°. The mass of the elevator when loaded is 2000 kg and move with speed of 2.5m/s. the brake has a sufficient capacity to stop the elevator in 2.75 meters Assuming the coefficient of friction between the brake drum and shoes as 0.2 find (i) width of the shoe, if the allowable pressure on the brake shoe is limited to 0.3 N/mm^2 and (ii) heat generated in stopping the elevator.

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