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Question Paper Code : L 20846

B.E./B.Tech. DEGREE EXAMINATIONS, NOV./DEC. 2020
Sixth/Seventh Semester
Mechanical Engineering
ME 6601 – DESIGN OF TRANSMISSION SYSTEMS
(Common to Mechanical Engineering (Sandwich) Mechanical and
Automation Engineering)
(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A

(10×2=20 Marks)

1. A longer belt will last more than a shorter belt, why ?
2. List the advantages of wire ropes compared to chains.
3. State the advantages of toothed gears over the other types of transmission systems.
4. Why pinion is made harder than gear ?
5. What is a crown gear ?
6. Write some applications of worm-gear drive.
7. Draw the ray diagram for 12 speed gear box.
8. Write any two principles to be followed to obtain optimum design in gear box.
9. What is the function of clutch in a transmission system ?
10. What is the significance of pressure angle in cam design ?

PART – B

(5×13=65 Marks)

11. a) A nine speed gear box used as a headstock gear box of a turret lathe is to provide a speed range of 180 rpm to 1800 rpm. Using standard step ratio, draw the speed diagram, and the kinematic lay out. Also find and fix the number of teeth on all gears.

(OR)

b) Sketch the speed diagram and the kinematic layout for an 18 speed gear box for the following data : Motor speed = 1440 rpm, minimum output speed = 16 rpm, maximum output speed = 800 rpm, arrangement $2 \times 3 \times 3$. List the speeds of all the shafts when the output speed is 16 rpm.

12. a) Design a pair of straight spur gear to drive for a stone crusher, the pinion and wheel are made of C15 steel and cast iron grade 30 respectively. The pinion is to transmit 22 kW power at 900 rpm. The gear ratio is 2.5. Take pressure angle of 20° and working life of gears as 10,000 hours.

(OR)

b) Design a pair of helical gear to transmit 10 kW at 1000 rpm of the pinion. Reduction ratio of 5 is required. Pressure angle is 20° and the helix angle is 15° . The material for both the gears is 40 Ni2Cr1MO28. Give the details of the drive in a tabular form.

13. a) Design a worm gear drive to transmit 20 HP from a worm at 1440 rpm to the worm wheel. Assume the bronze is sand chill cast. The speed of the wheel should be $40 \pm 2\%$ rpm, initial sliding velocity can be assumed as 3 m/s and efficiency as 80%.

(OR)

b) Design a bevel gear drive to transmit 7.5 kW at 1440 rpm. Gear ratio 3. Pinion and gear are made of forged C45 steel. Life of gears 10,000 hrs. Assume surface hardened heat treatment and IS quality 6.

14. a) Draw the kinematic diagram and speed diagram of the headstock gear box of a turret lathe having arrangement for 9 spindle speeds ranging from 31.5 rpm to 1050 rpm. Calculate the number of teeth on each gear. Minimum number of teeth on a gear is 25. Also calculate the percentage deviation of the obtainable speeds from the calculated ones.

(OR)

b) The spindle of a pillar drill is to run at 12 different speeds in the range of 100 rpm and 355 rpm. Design the gear box. Sketch the layout of the gear box, indicating the number of teeth on each gear. The gear box receives 5 kW from an electric motor running at 360 rpm. Also sketch the speed diagram.

15. a) A multiplate clutch with both sides effective transmits 30 kW at 360 rpm. Inner and outer radii of the clutch discs are 100 mm and 200 mm respectively. The effective coefficient of friction is 0.25. An axial load of 600 N is applied. Assuming uniform wear conditions, find the number of discs required and the maximum intensity of pressure developed.

(OR)

- b) A 50 kg wheel, 0.5 m in diameter turning at 150 rpm in stationary bearings is brought to rest by pressing a brake shoe radially against the rim with a force of 100N. If the radius of gyration of wheel is 0.2 m, how many revolutions will the wheel make before coming to rest ? Assume that the coefficient of friction between shoe and rim has the steady value of 0.25.

PART – C

(1×15=15 Marks)

16. a) Design an 18-speed gearbox from a source of 1000 rpm. Maximum and minimum speeds are to be around 650 rpm and 35 rpm respectively.

(OR)

- b) Select a suitable wire rope for a mini hoist carrying a load of 2 tonnes to be lifted from a depth of 100m. A rope speed of 10m/s must be attained in 10 seconds. Assume minimum factor of safety as 10.
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