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

Question Paper Code : 91662

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Sixth Semester

Mechanical Engineering

ME 2352/ME 61/ME 1352/10122 ME 603 — DESIGN OF TRANSMISSION SYSTEMS

(Common to Mechanical and Automation Engineering

(Regulation 2008/2010)

(Common to PTME 2352/10122 ME 603 – Design of Transmission Systems for B.E. (Part-Time) Fifth/Sixth Semester Mechanical Engineering Regulation 2009/2010)

Time : Three hours Maximum : 100 marks

Use of approved Design Data Book is permitted.

Any missing data may be suitably assumed.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What do you understand by 6 × 19 construction in wire ropes?
2. Mention the losses in belt drives.
3. Specify the effects of increasing the pressure angle in gear design.
4. Why is a gear tooth subjected to dynamic load?
5. What is virtual number of teeth in bevel gears?
6. Mention the advantages of worm gear drive.
7. What are preferred numbers?
8. Specify four types of gearboxes.
9. Differentiate between uniform pressure and uniform wear theories adopted in the design of clutches.
10. In a hoisting machinery, what are the different energies absorbed by a brake system?

PART B — (5 × 16 = 80 marks)

11. (a) A compressor is to run by a motor pulley running at 1440 rpm, speed ratio 2.5. Choose a flat belt crossed drive. Centre distance between pulleys is 3.6m. Take belt speed as 16 m/s. Load factor is 1.3. Take a 5-ply, flat Dunlop belt. Power to be transmitted is 12kW. High speed load rating is 0.0118 kW/ply/mm width at V=5m/s. Determine the width and length of the belt.

Or

(b) At the construction site, 1 tonne of steel is to be lifted up to a height of 20 m with the help of 2 wire ropes of 6 × 19 size, nominal diameter 12 mm, and breaking load 78 kN. Determine the factor of safety if the sheave diameter is 56 d and if wire rope is suddenly stopped in 1 second when travelling at a speed of 1.2 m/s. What is the factor of safety if bending load is neglected?

12. (a) Design a spur gear drive for a stone crusher where the gears are made of C40 steel. The pinion is transmitting 30 kW at 1200 rpm. The gear ratio is 3. Take the working life of the gears as 7500 hrs.

Or

(b) Design a helical gear drive to connect an electric motor to a reciprocating pump. Gears are overhanging in their shafts. Motor speed = 1440 rpm. Speed reduction ratio = 5, Motor power = 37 kW Pressure angle = 20° Helix angle = 25°.

13. (a) Derive expressions for determining the forces acting on a bevel gear with suitable illustrations.

Or

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

14. (a) A sixteen speed gear box is required to furnish output speeds in the range of 100 to 560 rpm. Sketch the kinematic arrangement and draw the speed diagram.

Or

(b) A sliding mesh gear box is to be used for '4' forward and '1' reverse speeds. First gear speed ratio is 5.5 and reverse gear speed ratio is 5.8. Clutch gear on clutch shaft and gear (in constant mesh) on lay shaft has speed ratio of 2. Calculate the number of teeth on all the gears. Assume that the minimum number of teeth on any gear should not be less than 18. Calculate actual gear ratios. Assume that the geometric progression for gear ratios, top gear (fourth), third gear, second and first gear is $1:x:x^2:x^3$.

15. (a) An automobile engine has an output of 80kW at 3000 rpm. The mean diameter of the clutch is 200mm with a permissible pressure of $0.2N/mm^2$. Friction lining is of asbestos with $\mu = 0.22$. What should be the inner diameter of the disc? Take both the sides of the plates with friction lining as effective. These are 8 springs and axial deflection in spring is limited to 10mm. Given $G = 80kN/mm^2$. Spring index may be taken as 6.

Or

(b) Derive an expression to determine the braking torque for an internal expanding shoe brake.

———————