B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATION, APR /MAY 2014

MECHANICAL ENGINEERING BRANCH

Sixth Semester – (R-2008)

ME 9353 – DESIGN OF TRANSMISSION SYSTEMS

(APPROVED DESIGN DATA BOOK PERMITTED)

TIME: 3 hrs **ANSWER ALL QUESTIONS** **MAX MARKS: 100**

PART – A (10X2 = 20 Marks)

1. What does it mean by crowning of pulleys and why it is being done?
2. State the conditions to be followed while installing flat belt.
3. Classify brakes based on the application of direction of breaking force.
4. Write the reasons for considering load concentration factor and dynamic load factor in the design of gear pairs.
5. What is known as a corrected gear?
6. Differentiate axial pitch and normal pitch of a helical gear.
7. Why cone clutches are better than disc clutches?
8. What are known as mitter gears?
9. What will happen, when lead angle of the worm is greater than the friction angle of the surfaces in contact?
10. (i) The speeds of gears of a gear box is in geometric progression in order to maintain -------- as minimum.

    (ii) In a gear- box, for a set of gears, if the centre distance and module are same, then the sum of teeth of engaging pair will be .....

PART – B (5 X 16 = 80 Marks)

11. Design a nine speed gear box for a milling machine with speeds ranging from 56 to 900 rpm. The input speed is 720 rpm. Make a neat sketch of gear box and indicate the number of teeth on all the gears and speeds. For each stage, assume the number of teeth on driver as 20. Ensure standard step ratio.

12. (a) Two spur gears are to be used for a rock crusher drive and are to be of minimum size. Gears are to be designed for the following requirements. Power to be transmitted = 18 kW, speed of pinion 1200 rpm, angular velocity ratio =3.5: 1, tooth profile 20° stub. Assume that gears are made of case hardened alloy steel (15 Ni2 Cr1 Mo15), life of 20,000 hrs, symmetric scheme, rotation in one direction, IS quality 8, surface hardness greater than 350HB and pinion tooth as 16. Design the drive.

(OR)

12. (b) A general purpose enclosed gear train is based on parallel helical gears, specified life is 36,000 hrs. Torque at driven shaft is 411 Nm. Driving shaft speed is 475 rpm. Velocity ratio is 4. It is desired to have ***standard centre distance.*** Assume both pinion and gear are made of 40 Ni2 Cr1 Mo 28, helix angle = 10°, ψ = 0.5, Z_1= 17, surface hardness greater than 350HB and IS quality 6.

13. (a) Design a bevel gear to transmit 3.5 kW. Speed ratio = 4. Driving shaft speed = 200 rpm. The drive is non reversible. Pinion is of steel C45 and wheel is of CI grade 30 (σ_u = 300 N/mm^2) with FOS 2.5 and average HB value. Assume life of 25000 hrs, surface hardness greater than 350HB for pinion with 18 teeth, IS quality 8 and ψ_v = 3.

(OR)

13. (b) Design a worm gear drive to transmit 22.5 kW power at a worm speed of 1440 rpm, velocity ratio 24:1. Minimum efficiency required is 85%. Assume the worm and wheel is made of steel and sand cast bronze respectively and initial sliding velocity as 3 m/s.

14. (a) A V – belt drive is to transmit 20 kW from a V – pulley of 250 mm pitch diameter operating at 1800 rpm to a 900 mm diameter flat pulley. The centre distance between the input and output shafts is 1 m. The groove angle is 40°. The co efficient of friction between belt and V pulley and that between belt and flat pulley are same and equal to 0.2. The cross section of the belt is 38 mm wide at the top, 19 mm wide at the bottom and 23 mm deep. If single belt weighs 11 kN/m^3 and allowable tension per belt is 900 N, calculate number of belts required and determine which pulley governs the design? Belt thickness should be considered in lap angle calculation.

(OR)

14. (b) Design a chain drive subjected to variable mild shock loads, to run a compressor from a 11 kW electric motor running at 970 rpm. The compressor speed is 330 rpm and the compressor operates 16 hrs/day. The center distance should be approximately 500 mm. The sprockets are horizontal, drops lubricated. The chain tension can be adjusted by shifting the motor on slides. Z_1 can be assumed on the higher side of i and pitch value nearer to p_{max} may be selected for quicker solution.

15. (a) A leather faced conical clutch has cone angle of 30°. The pressure between the contact surfaces is limited to 0.35 N/mm^2 and the breadth of the conical surface is not to exceed 1/3 of the mean radius. Find the dimensions of the contact surfaces to transmit 22 kW at 2000 rpm. Also calculate the force required to engage the clutch. Take co efficient of friction as 0.15. Assume uniform wear theory and service factor 2.5.

(OR)

15. (b) A 360 mm radius brake drum contacts a single shoe as shown below and sustains 225 Nm torque at 500 rev/min. For a co efficient of friction of 0.3 determine (a) The required force F to apply the brake for clockwise and anti clock wise rotation (b) The dimension c required to make the brake self locking, assuming the other dimensions remain as shown (c) the rate of heat generated.