B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2013

AGRICULTURE & IRRIGATION ENGINEERING

Third Semester

AI 9202 THEORY OF MACHINES

(Regulation 2008)

Time: 3 Hours　　　　　Answer ALL Questions　　　　　Max. Marks 100

PART – A (10 x 2 = 20 Marks)

1. Define kinematic pair and classify it.
2. Define instantaneous centre of velocity.
3. Differentiate between pivot and collar bearing.
4. List down the applications of antifriction bearings.
5. What are the disadvantages of V-belt drive over flat belt?
6. What are the functions of clutches?
7. How are cams classified based on the follower motion?
8. Where are the roller follower extensively used?
9. Where the epicyclic gear trains are used?
10. Differentiate between governor and flywheel.

PART – B (5 x 16 = 80 Marks)

11. In a four bar chain ABCD, link AD is fixed and the crank AB rotates at 10 radians per second clockwise. Lengths of the links are AB = 60 mm, BC = CD = 70 mm and DA = 120 mm. When angle DAB = 60° and both B and C lie on the same side of AD, find 1. Angular velocities (magnitude and direction) of BC and CD; and 2. Angular acceleration of BC and CD.

12.a) A load of 25 kN is supported by a conical pivot with angle of cone as 120°. The intensity of pressure is not to exceed 350 kN/m^2. The external radius is 2 times the internal radius. The shaft is rotating at 180 rpm and coefficient of friction is 0.05. Find the power absorbed in friction assuming uniform pressure.

(OR)

12.b) In a thrust bearing the external and internal radii of the contact surfaces are 210 mm and 160 mm respectively. The total axial load is 60 kN and coefficient of friction = 0.05. The shaft is rotating at 380 rpm. Intensity of pressure is not to exceed 350 kN/m^2. Calculate :
　　(i) Power lost in overcoming the friction and
　　(ii) Number of collars required for the thrust bearing.

13.a) A belt drive is required to transmit 10 kW from a motor running at 600 rpm. The belt is 12 mm thick and has a mass density of 0.001 g/mm^3. Safe stress in the belt is not to exceed 2.5 N/mm^2. Diameter of the driving pulley is 250 mm, whereas the speed of the driven pulley is 220 rpm. The two shafts are 1.25 m apart. The coefficient of friction is 0.25. Determine the width of the belt.

(OR)

13.b) Calculate the power transmitted by a single plate clutch at a speed of 2000 rpm, if the outer and inner radii of friction surfaces are 150 mm and 100 mm respectively. The maximum intensity of pressure at any point of contact surface should not exceed 0.8 x 10^5 N/m^2. Take both sides of the plate as effective and coefficient of friction = 0.3. Assume uniform wear.

14.a) A cam operating a knife-edged follower has the following data:
   (i) Follower moves outwards through 40 mm during 60° of cam rotation.
   (ii) Follower dwells for the next 45°.
   (iii) Follower returns to its original position during next 90°.
   (iv) Follower dwells for the rest of the rotation.
The displacement of the follower is to take place with simple harmonic motion during both the outward and return strokes. The least radius of the cam is 50 mm. Draw the profile of the cam when the axis of the follower is offset 20 mm towards right from the cam axis.

(OR)

14.b) Draw the profile of the cam when the roller follower moves with cycloidal motion as given below:
   (i) Outstroke with maximum displacement of 44 mm during 180° of cam rotation.
   (ii) Return stroke for the next 150° of cam rotation.
   (iii) Dwell for the remaining 30° of cam rotation.
The minimum radius of cam is 20 mm and the diameter of the roller is 10 mm. the axis of the roller follower passes through the cam shaft axis.

15.a) Classify with neat sketch and an application of the following
   (i) Toothed gearing
   (ii) Gear trains

(OR)

15.b) All the arms of a porter governor are 250 mm long. The upper arms are hinged at a distance of 40 mm from the axis of rotation whereas the lower arms are pivoted at a distance of 50 mm from the axis of rotation. The mass of each ball is 2.5 kg and mass of sleeve is 25 kg. The force of friction on the sleeve is 20 N. The masses revolve at a radius of 125 mm at minimum speed and at a radius of 150 mm at maximum speed. Determine the range of speed.