[03 – 3113]

III/IV B.E. DEGREE EXAMINATION.

First Semester

Mechanical Engineering

THEORY OF MACHINES — II

(Effective from the admitted batch of 2006–2007)

Time : Three hours   Maximum : 70 marks

Question No. 1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

Missing data if any may be assumed suitably.

1.   (a)   What is the expression for gyroscopic couple?

(b)   What is meant by gyroscopic couple?

(c)   What is the importance of pressure angle in cam design?

(d)   What are the different forms if a tooth?

(e)   What are the functions of a differential gear in an automobile?

(f)   What is meant by a dynamically equivalent system?

(g)   What is the expression for the transverse vibration of a uniformly loaded shaft?

2. (a) Explain how Gyroscopic stabilization is used in ships.

   (b) The turbine rotor of a ship having a mass of 200 kg rotates at 2000 rpm and its radius of gyration is 0.3 m. If the rotation of the rotor is clockwise looking from the aft, determine the gyroscopic couple set by the rotor when

      (i) Ship takes a left hand turn at a radius of 300 m at a speed of 30 km/hr,

      (ii) Ship pitches with the bow rising at an angular velocity of 1 rad/sec,

      (iii) Ship rolls at an angular velocity of 0.1 rad/s.

3. (a) Explain the functions of cams and followers. What are different applications cams in automobiles?

   (b) Draw the profile of tangent cam with circular flank and explain the terminology and functionality of the cam.

4. (a) Explain atleast eight properties of involute toothed gear in mesh.

   (b) If the angle of obliquity of a pair of gear wheels is 200, and the arc of approach or recess not less than the pitch, what will be the least number of teeth on the pinion?

5. In an epicyclic gear train, an arm carries two wheels A and B having 36 and 45 teeth respectively. If the arm rotates at 150 rpm in the anticlock wise direction about the centre of the wheel A and is fixed, determine the speed of wheel B. If the wheel A instead of being fixed, makes 300 rpm in the clockwise direction, what will be the speed of B.

6. (a) Explain role of reference plane in balancing masses of rotation in different planes.

   (b) Explain why two balancing weights are required to balance the weights rotating in different planes, compared to single balance weight required to balance weights rotating in one plane.

   (c) Describe reasons in detail for partial balancing of reciprocating masses.

7. (a) Derive an equation for the transverse vibration of a uniformly loaded shaft.

   (b) A rigid mass less bar of length L is hinged at its end and carries a spring K2 with mass at its right end. The bar is also supported by a spring K1 at a distance from the left hinge. Determine the natural frequency of the bar.

8. (a) Distinguish between longitudinal, transversed and torsional free vibrations.

   (b) Derive an equation for the transverse vibration of a uniformly loaded shaft.

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