Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

CPME 6302

Fifth Semester (Special) Examination – 2013

MACHINE DYNAMICS-II

BRANCH : MECH

QUESTION CODE : D 297

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (a) Describe where Hooke's joints are used.

   (b) What is reactive gyroscopic couple ?

   (c) Explain the term pressure angle.

   (d) Explain the terms : (i) Module and (ii) Addendum.

   (e) Name the different types of cam are in use.

   (f) What is the function of a Governor ?

   (g) What is inertia force ?

   (h) What is partial balancing ?

   (i) Define the terms 'damping coefficient' and 'damping factor'.

   (j) What do you mean by whirling of shaft ?

2. (a) State the condition for correct steering. 4

   (b) With a neat sketch explain the working principle of Ackerman steering gear ? What are its advantage and disadvantage compared to Davis steering gear ? 6

3. The turbine of a rotor of a ship has a mass of 2400 kg and rotates at 1800 rpm clockwise when viewed from the aft. The radius of the gyration of the rotor is 335 mm. Determine the gyroscopic couple and its effect when (i) the ship turns right at a radius of 260 m with a speed of 25 km/h. (ii) The ship pitches with the bow rising at an angular velocity of 0.8 rad/s. (iii) The ship rolls at an angular velocity of 0.15 rad/s. 10

4. (a) Explain the law of gearing. 5

(b) Two gears of module 4mm have 24 and 33 teeth. The pressure angle is 20° and each gear has a standard addendum of one module. Find the length of arc of contact and the maximum velocity of sliding if the pinion rotates at 120 r.p.m. 5

5. A cam with 30 mm as minimum diameter is rotating clockwise at a uniform speed of 1200 r.p.m. and has to give the following motion to a roller follower 10 mm in diameter :

(a) Follower to complete outward stroke of 25 mm during 120° of cam rotation with simple harmonic motion

(b) Follower to dwell for 60° of cam rotation

(c) Follower to return to its initial position during 90° of cam rotation with simple harmonic motion

(iv) Follower to dwell for the remaining 90° of cam rotation.

Draw the profile of the cam and determine the maximum velocity and the acceleration of the follower during outstroke and the return stroke. 10

6. (a) Explain the terms stability, sensitiveness, isochronism and hunting related to governors. 4

(b) With neat diagram explain how porter governor is different from proell governor. 6

7. A rotating shaft carries four unbalanced masses 18 kg, 14 kg, 16 kg and 12 kg at radii 50 mm, 60 mm, 70 mm and 60 mm respectively. The 2nd, 3rd and 4th masses revolve in planes 80 mm, 160 mm and 280 mm respectively measured from the plane of the first mass and are angularly located at 60°, 135° and 270° respectively measured clockwise from the first mass looking from this mass end of the shaft. The shaft is dynamically balanced by two masses, both located at 50 mm radii and revolving in planes mid-way between those of 1st and 2nd masses and midway between those of 3rd and 4th masses. Determine the magnitudes of the masses and their respective angular positions. 10

8. Write short notes on any **two** of the following : 5×2

(a) Free vibration and forced vibration

(b) Gyroscopic couple

(c) Interference in gears.
