9. The turbine rotor of a ship has a mass of 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 r.p.m. clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship :

(a) When the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/h.

(b) When the ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12 degrees. 20

B. Tech. 5th Semester (ME) Examination,

December–2015

DYNAMICS OF MACHINES

Paper–ME–301–F

Time allowed : 3 hours] *[Maximum marks : 100*

Note : *Attempt any **five** questions in all. **Question No. 1** is **compulsory** and select at least **one** question from each section.*

1. (a) What is Static Balancing ? 2×10

(b) What do you mean by Dynamic Balancing ?

(c) Write the formula of Primary Unbalanced Force.

(d) What is Tractive Force ?

(e) What do you mean by Hammer Blow ?

(f) What is firing order ?

(g) Name the various types of dynamometers.

(h) What is Precession Motion ?

(i) Name the different type of Governor.

(j) What do you mean by Hunting ?

Section–A

2. Four masses 200 kg, 250 kg, 150 kg and 100 kg are attached at the radii of rotation are 100 mm, 120 mm, 250 mm and 300 mm respectively. The angles between the successive masses are 45, 70, and 140 degree respectively. Find the position and magnitude of the balancing mass required, if its radius of rotation is 350 mm. 20

3. Describe in detail the analytical and graphical method of obtaining the torque exerted on crank shaft when weight of connecting rod is considered. 20

Section–B

4. (a) Define and explain the term Balancing of Rotating masses. What will be harm if the rotating parts of high speed engine are not properly balanced ? 10

   (b) A mass is attached to a shaft which is rotating at an angular speed of w rad/s. describe the procedure of balancing this mass by :

   (1) A single mass only

   (2) Two masses in different plane. 10

5. Explain the Partial Balancing of Primary Unbalanced Force in Reciprocating Engine with the help of mathematical derivation ? 20

Section–C

6. In an engine governor of the Porter type, the upper and lower arms are 200 mm and 250 mm respectively and pivoted on the axis of rotation. The mass of the central load is 15 kg, the mass of each ball is 2 kg and friction of the sleeve together with the resistance of the operating gear is equal to a load of 24 N at the sleeve. If the limiting inclinations of the upper arms to the vertical are 30° and 40°, find, taking friction into account, range of speed of the governor. 20

7. (a) With a neat sketch describe the principle and working of torsion dynamometer. 10

   (b) Explain the working of belt transmission dynamometer. 10

Section–D

8. Derive expression of gyroscopic couple. Also explain the gyroscopic effect on four wheeled vehicles. 20