

B. Tech 5th Semester Examination

Dynamics of Machines (NS)

ME-315

Time : 3 Hours

Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt any five questions in all selecting one question from each of the sections A, B, C & D and all the subparts of the question in Section-E.

SECTION - A

1. Derive expressions for velocity and acceleration of the piston of a slider crank mechanism in terms of crank radius r , connecting rod length l , crank angle θ from inner dead centre position and the constant angular velocity ω of the crank. (20)
2. Find the inertia force for the following data of an I.C. engine:
Bore = 175 mm, stroke = 200 mm, speed = 500 r.p.m, length of the connecting rod = 400 mm, crank angle = 60° from TDC and mass of reciprocating parts = 180 kg. (20)

SECTION - B

3. A vertical single cylinder engine has a cylinder diameter of 250 mm and stroke length of 150 mm. The reciprocating parts have a mass of 180 kg. The connecting rod is four times the crank radius and the speed is 360 r.p.m when crank has turned through an angle of 45° from top dead centre, the net pressure on the piston is 1.05 MN/m^2 . Calculate the effective turning moment on the crank shaft for this position. (20)
4. A single cylinder engine runs at 250 r.p.m and has a stroke of 180 mm. The reciprocating parts have a mass of 120 kg and revolving parts are equivalent to a mass of 70 kg at a radius of 90 mm. A mass is placed outside the crank at a radius of 150 mm to balance the whole of the revolving mass and two

thirds of the reciprocating mass. Determine the magnitude of balancing mass and resultant residual unbalance force when the crank has turned 30° from IDC. Neglect the obliquity of connecting rod. (20)

SECTION - C

5. Derive expressions for the effort and power of a Porter governor. (20)
6. A single cylinder four stroke cycle engine develops 37.3 kW at 300 r.p.m. The change of speed from the commencement of power stroke to its end must not exceed half percent of mean speed on either side. Find diameter and cross section of a suitable rim having width four times the depth so that the hoop stress does not exceed 3.92 N/mm^2 . Assume that the work done during power stroke is 1.35 times, the work done during the cycle. Density of rim material is 7.2 gm per cu-cm. (20)

SECTION - D

7. Describe the construction and operation of a rope brake absorption dynamometer. (20)
8. A high speed ship is driven by a turbine, rotor of which has a moment of inertia of 20 kg-m^2 and is running at 3000 r.p.m in clockwise direction when viewed from the bow. The ship is speeding at 72 km/hr taking a right turn round a curve of 600 m radius. Determine the gyroscopic couple applied to the ship and its effects. (20)

SECTION - E

9. (a) Define inertia torque.
(b) What is an indicator diagram?
(c) Define coefficient of fluctuation of energy.
(d) What is meant by dynamic balance?
(e) What do you understand by primary unbalanced forces?
(f) Define sensitiveness of governor.
(g) What is the function of a governor?
(h) What are the types of dynamometer?
(i) What is pitching of ship?
(j) Explain precessional motion. (2×10=20)