PVP 14

Code: ME5T1

III B.Tech - I Semester – Regular/Supplementary Examinations
March 2021

DYNAMICS OF MACHINERY
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) Distinguish between brake and clutch.

b) Compare single plate clutch with multi-plate clutch on the basis of Power transmitted and its size.

c) Define centrifugal clutch.

d) List out applications of gyroscopic principle

e) Define D'Alembert's principle.

f) List out the forces acting on the connecting rod.

g) Define the terms 'coefficient of fluctuation of energy' and coefficient of fluctuation of speed' in the case of fly wheels.

h) What is meant by isochronous conditions governor?

i) Distinguish between primary and secondary balancing.

j) List out the two reasons for effect of unbalancing.

k) List out the causes and effect of vibration.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.
16 x 3 = 48 M

2. a) Explain working of centrifugal clutch with a help of a neat Sketch. 8 M

b) A Multiple plate clutch has steel on bronze is to transmit 8 KW at 1440 rpm. The inner diameter of the contact is 80mm and outer diameter of contact is140 mm. The clutch operates in oil with coefficient of friction of 0.1. The Average allowable pressure is 0.35Mpa. Assume uniform wear theory and determine the following: 8 M

i. Number of steel and bronze plates
ii. Axial force required
iii. Actual maximum pressure

3. a) Explain the effect of gyroscopic couple on steering, pitching and rolling of a ship. 8 M

b) An aeroplane flying at 240km/hr turns towards the left and completes a quarter circle of 60m radius. The mass of rotar engine and the propeller of the plane is 450kg with radius of gyration of 320mm. the engine speed is 2000rpm clockwise when viewed from the rear. Determine the gyroscopic couple on the aircraft and its effect. In what way is the effect changed when the

i. Aeroplane turns towards right

ii. Engine rotates clockwise when viewed from the front(nose end) and the aeroplane turns left and right

8 M

4. a) What are the centrifugal governors? List out some of the centrifugal governors ? 8 M

b) The turning moment diagram for a multi cylinder engine has been drawn to a scale of 1mm =325N-m vertically and 1mm = 3^{o} horizontally. The areas above and below the mean torque line are -26, +378, -256, +306, -302, +244, -261 and -225 mm^2 the engine is running at a mean speed of 600 rpm. The total fluctuation of speed is not to exceed ±1.8% of the mean speed. If the radius of flywheel is 0.7m, find the mass of the flywheel. 8 M

5. a) Derive the expression for unbalanced reciprocating primary and secondary forces in a single cylinder engine, with usual notations. 6 M

b) The cranks and connecting rods of a 4-cylinder in-line engine running at 1800 rpm are 60 mm and 240 mm each respectively and the cylinders are spaced 150 mm apart. If

the cylinders are numbered 1 to 4 in sequence from one end, the cranks appear at intervals of 90^o in an end view in the order 1-4-2-3. The reciprocating mass corresponding to each cylinder is 1.5 kg. Determine: 10 M

i) Unbalanced primary and secondary forces, if any, and

ii) Unbalanced primary and secondary couples with reference to central plane of the engine.

6. a) Derive an expression for the natural frequency of the spring mass system by Energy method. 8 M

b) Find the natural frequency of the system shown in the fig. 8 M