

Code: 9A03502

B.Tech III Year I Semester (R09) Supplementary Examinations June 2017

DYNAMICS OF MACHINERY

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 A uniform disc having a mass of 8 kg and a radius of gyration of 150 mm is mounted on one end of a horizontal arm of length 200 mm. the other end of the arm can rotate freely in a universal bearing. The disc given a clockwise spin of 250 rpm as seen from the disc end of the arm. Determine the motion of the disc if the arm remains horizontal.
- 2 The thrust on the propeller shaft of marine engine is taken by 8 collars whose external and internal diameters are 650 mm and 400 mm respectively. The thrust pressure is 0.5 MPa and may be assumed uniform. The coefficient of friction between the shaft and collars is 0.04. If the shaft rotates at 120 r.p.m, find: (i) Total thrust on the collars. (ii) Power absorbed by friction at the bearing.
- 3 A multi plate clutch transmits 25 kW of power at 1600 r.p.m. It has three discs on the driving shaft and two on the driven shaft. Coefficient of friction for the friction surfaces is 0.25. The external and internal radii of friction surfaces are 100 mm and 50 mm respectively. Find the maximum intensity of pressure between the discs. Assume uniform wear.
- 4 A mass of flywheel of a steam engine is 2000 kg and has got a radius of gyration of 76 cm. the starting torque of steam engine is 1300 N-m and may be assumed constant. Determine the angular acceleration of flywheel along with speed and kinetic energy after 10 sec.
- 5 Sketch a Hartnell governor. Describe its function and deduce a relation to find the stiffness of the spring.
- 6 (a) A shaft carries five masses m_1 , m_2 , m_3 , m_4 and m_5 which revolve at the same radius in planes which are equidistant one from another. The magnitudes of the masses in planes 1, 3, and 4 are 40 kg, 40 kg and 80 kg respectively. Determine the masses in planes 2 and 5 and their rotating balance.
(b) Why is balancing necessary for rotors of high sped engines?
- 7 A single cylinder horizontal engine runs at 120 rpm. The length of the stroke is 400 mm. the mass of the revolving parts assumed concentrated at the crank pin is 100 kg and mass of the reciprocating parts is 150 kg. Determine the magnitude of the balancing mass required to be placed opposite to the crank at a radius of 150 mm which is equivalent to all the revolving and $\frac{2}{3}$ rd of the reciprocating masses. If the crank turns 30° from the inner dead centre, find the magnitude of the unbalanced force due to the balancing mass.
- 8 (a) What is the logarithmic decrement? Derive the relation for the same.
(b) What do you mean by the steady-state response of the system in case of forced vibration?
