

BT-4/J07

Dynamics of Machines

Paper : MET-212

Time : 3 Hours]

[Maximum Marks : 75

Note : Attempt any FIVE questions.

1. (a) What is free body diagram ? Explain with example. 5
(b) The following data refer to a steam engine :
Diameter of piston = 240 mm; stroke = 600 mm
Length of connecting rod = 1.5 m; centre of gravity of connecting rod from crank pin = 500 mm; radius of gyration of the connecting rod about the axis through the centre of gravity = 650 mm.
Determine the magnitude and direction of torque exerted on the crank shaft when the crank has turned through 30° from inner dead centre. 10
2. (a) Explain the draw turning moment diagrams for
(i) Single cylinder double acting steam engine
(ii) Four stroke cycle IC engine
(iii) Multi cylinder engine. 9
(b) The maximum and minimum speed of flywheel are 242 r.p.m. and 238 r.p.m. respectively. The mass of flywheel is 2600 Kg and radius of gyration is 1.8 m. Find (i) mean speed of flywheel (ii) maximum fluctuation of energy (iii) Co-efficient of fluctuation of speed. 6
3. (a) The number of teeth on each of the two equal spur gears in mesh is 40. The teeth have 20° involute profile and the module is 6 mm. If the arc of contact is 1.75 times the circular pitch, find the addendum. 6
(b) In an epicyclic gear train a gear C is keyed to the driving shaft A which rotates at 900 rpm. Gears D and E are fixed together and rotate freely on pin carried by the arm M which is keyed to the driven shaft B. Gear D is in mesh with gear C while E is meshed with fixed annular wheel F. The F is concentric with the driven shaft B. If shafts A and B are collinear and number of teeth on gears C, D, E and F are respectively 21, 28, 14 and 84. Find speed and direction of rotation of B. 9
4. (a) Differentiate between self locking and self energizing brakes. 5
(b)

- Explain with neat sketch, the working principle of internal expanding shoe brake and derive expression for moments and torque. 10
5. (a) In a Hartnell governor if the spring of greater stiffness is used then the governor sensitivity will increase or decrease. Explain clearly. 5
- (b) With neat sketch explain working of Wilson-Hartnell governor and derive an expression for its equilibrium speed. 10
6. (a) Derive effect of gyroscopic couple and centrifugal couple on two wheel vehicle while taking turn. 6
- (b) A, B, C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 Kg, 5 Kg and 4 Kg respectively. Find required mass A and the relative angular setting of the four masses so that the shaft shall be in complete balance. 9
7. (a) Explain the term precessional motion and gyroscopic couple and explain gyroscopic effect on Naval Ship. 6
- (b) What is meant by transfer function? Determine the transfer function of a spring controlled governor. 9
8. Write short notes on the following: WLEDGE
- (i) Open and Close loop control system. 5
- (ii) How will you find the line of action of inertia force for a link by the use of dynamically equivalent system? 5
- (iii) Pre selective gear box. 5