

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

B.Tech II Year II Semester Regular & Supplementary Examinations August-2023

THEORY OF MACHINES

(Common to AGE & ME)

Time: 3 Hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

UNIT-I

- 1 a Explain the effect of gyroscopic couple on a Aeroplane. CO1 L2 4M
 b The turbine rotor of a ship has a mass of 8 tonnes and a radius of gyration 0.6 m. It rotates at 1800 r.p.m. clockwise, when looking from the stern. Determine the gyroscopic couple, if the ship travels at 100 km/hr and steer to the left in a curve of 75 m radius. CO1 L3 8M

OR

- 2 The turning moment diagram for a petrol engine is drawn to the following scales : Turning moment, 1 mm = 5 N-m ; crank angle, 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm². The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m CO1 L3 12M

UNIT-II

- 3 Explain the working of a single-plate clutch with neat sketch. CO2 L1 12M

OR

- 4 a Write the principle of Dynamometer and types of Dynamometers. CO2 L1 4M
 b A conical friction clutch is used to transmit 90 kW at 1500 r.p.m. The semi cone angle is 20° and the coefficient of friction is 0.2. If the mean diameter of the bearing surface is 375 mm and the intensity of normal pressure is not to exceed 0.25 N/mm², find the dimensions of the conical bearing surface and the axial load required. CO2 L3 8M

UNIT-III

- 5 a Derive the expression for Porter governor? CO3 L3 8M
 b What is meant by Sensitiveness of governors? CO3 L1 4M

OR

- 6 A Porter governor has all four arms 250 mm long. The upper arms are attached on the axis of rotation and the lower arms are attached to the sleeve at a distance of 30 mm from the axis. The mass of each ball is 5 kg and the sleeve has a mass of 50 kg. The extreme radii of rotation are 150 mm and 200 mm. Determine the range of speed of the governor. CO3 L3 12M

UNIT-IV

- 7 A shaft carries four masses in parallel planes A, B, C and D in this order along its length. The masses at B and C are 18 kg and 12.5 kg respectively, and each has an eccentricity of 60 mm. The masses at A and D have an eccentricity of 80 mm. The angle between the masses at B and C is 100° and that between the masses at B and A is 190° , both being measured in the same direction. The axial distance between the planes A and B is 100 mm and that between B and C is 200 mm. If the shaft is in complete dynamic balance, determine: 1. The magnitude of the masses at A and D ; 2. the distance between planes A and D ; and 3. the angular position of the mass at D

OR

- 8 a Derive the following expression of effects of partial balancing in two cylinder locomotive engine (i) Variation of attractive force (ii) Swaying couple (iii) Hammer blow. **CO4 L3 10M**
b What is balancing of rotating masses? **CO4 L1 2M**

UNIT-V

- 9 a Derive the Natural Frequency of Free Torsional Vibrations. **CO5 L3 10M**
b Define resonance. **CO5 L1 2M**

OR

- 10 A shaft of 100 mm diameter and 1 metre long has one of its end fixed and the other end carries a disc of mass 500 kg at a radius of gyration of 450 mm. The modulus of rigidity for the shaft material is 80 GN/m². Determine the frequency of torsional vibrations. **CO5 L3 12M**

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