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

B.Tech II Year II Semester Regular Examinations October-2022

THEORY OF MACHINES

(Common to ME & AGE)

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 Naval ship during pitching. L2 4M
 b The turbine rotor of a ship has a mass of 8 tonnes and a radius of gyration 0.6m. 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. L3 8M

OR

- 2 The turning moment diagram for a petrol engine is drawn to the following scales : L3 12M
 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.

UNIT-II

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

OR

- 4 A band brake acts on the 3/4th of circumference of a drum of 450 mm diameter which is keyed to the shaft. The band brake provides a braking torque of 225 N-m. One end of the band is attached to a fulcrum pin of the lever and the other end to a pin 100 mm from the fulcrum. If the operating force is applied at 500 mm from the fulcrum and the coefficient of friction is 0.25, find the operating force when the drum rotates in the (a) anticlockwise direction, and (b) clockwise direction. L3 12M

UNIT-III

- 5 a What is meant by Sensitiveness of governors? L1 2M
 b Calculate the vertical height of a Watt governor when it rotates at 60 r.p.m. L1 10M
 Also find the change in vertical height when its speed increases to 61 r.p.m

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. L3 12M

UNIT-IV

- 7 A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B 45° , B to C 70° and C to D 120° . The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions. **L3 12M**

OR

- 8 a What is balancing of rotating masses? **L1 2M**
 b Differentiate 'static balancing' and 'dynamic balancing'. State the necessary conditions to achieve them. **L4 10M**

UNIT-V

- 9 a Define Whirling speed (or) critical speed. **L1 2M**
 b A cantilever shaft 50 mm diameter and 300 mm long has a disc of mass 100 kg at its free end. The Young's modulus for the shaft material is 200 GN/m^2 . Determine the frequency of longitudinal and transverse vibrations of the shaft. **L3 10M**

OR

- 10 The measurements on a mechanical vibrating system show that it has a mass of 8 kg and that the springs can be combined to give an equivalent spring of stiffness 5.4 N/mm. If the vibrating system have a dashpot attached which exerts a force of 40 N when the mass has a velocity of 1 m/s, find : 1. Critical damping coefficient, 2. damping factor, 3. Logarithmic decrement, and 4. Ratio of two consecutive amplitudes. **L3 12M**

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