

INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)
End Semester Examination Dec 2019/Jan 2020
B Tech (Marine Engineering)
Semester –II
UG11T3206 – Engineering Mechanics II

Date: 13.01.2019
Time: 3 Hours

Max Marks: 70
Pass Marks: 35

Part – A (compulsory)

Answer the following (10x2=20 Marks)

- 1) State the laws of kinetic friction.
- 2) Define sliding friction and rolling friction.
- 3) State the laws of isochronism.
- 4) Explain the term torque?
- 5) State the D'Alembert's Principle.
- 6) Define the terms beat and Periodic Time as applied to SHM.
- 7) Write down the equation for power transmitted by a belt.
- 8) Define initial tension in the belt.
- 9) Define dynamometer and what are the type of dynamometer.
- 10) Define Hunting of governor.

Part – B

Answer any 5 out of 7 questions (5 x 10= 50 marks)

11)

A body, resting on a rough horizontal plane, required a pull of 180 N inclined at 30° to the plane just to move it. It was found that a push of 220 N inclined at 30° to the plane just moved the body. Determine the weight of the body and the coefficient of friction.

(10 marks)

12)

(a) A flywheel of mass 8 tonnes starts from rest, and gets up a speed of 180 r.p.m. in 3 minutes. Find the average torque exerted on it, if the radius of gyration of the flywheel is 60 cm.

(5 marks)

(b) The equation for angular displacement of a body moving on a circular path is given by : $\theta = 2t^3 + 0.5$, where θ is in rad and t in sec. Find angular velocity, displacement and acceleration after 2 sec.

(5 marks)

- 13) (a) A simple pendulum of amplitude 4° performs 24 oscillations in one minute. Find (i) length of the pendulum (ii) maximum acceleration of the bob, (iii) maximum linear velocity of the bob; and (iv) maximum angular velocity of the bob. (5 Marks)

(b) A conical pendulum 1.5 m long is revolving at 30 revolutions per minute. Find the angle which the string will make with the vertical, if the bob describes a circle of 500 mm radius. (5 Marks)

- 14) A rope drive is required to transmit 1 MW from a pulley of 1 meter diameter running at 450 r.p.m. The safe pull in each rope is 2.25 kN and the rope has mass of 1 kg per meter. The angle of lap and the groove angle is 150° and 45° respectively. Find the number of ropes required for the drive, if the coefficient of friction between the rope and the pulley is 0.3. (10 Marks)

- 15) A band brake acts on the $\frac{3}{4}$ th 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. (10 Marks)

- 16) In a spring loaded Hartnell type governor, the extreme radii of rotation of the balls are 80 mm and 120 mm. The ball arm and the sleeve arm of the bell crank lever are equal in length. The mass of each ball is 2 kg. If the speeds at the two extreme positions are 400 and 420 r.p.m. Find :
(a) The initial compression of the central spring, and
(b) The spring constant (10 Marks)

- 17) 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/mm^2 , find the dimensions of the conical bearing surface and the axial load required. (10 Marks)