INDIAN MARITIME UNIVERSITY

Time Bound Assignment September/October 2020

B Tech (ME) Arrear Examinations

Engineering Mechanics- II
UG11T2206

Date: 30/09/2020	Maximum Marks: 70
Time: 3 Hrs	Pass Marks: 35

Part – A (compulsory)

Answer the following (10x2=20 Marks)

1. State the laws of dynamic friction

2. Write down the formula of frictional torque assuming uniform pressure distribution?

3. Derive the relationship between the torque and angular acceleration.

4. State Newton's first, second and third law of motion.

5. Define the law of Isochronisms as applied to simple pendulum

6. A mass supported by a spring has a static deflection of 0.5 mm. Determine its natural frequency of oscillation**.**

7. What is Initial tension in a belt?

8. Write down the formula of belt tension ratio in flat belt drive and specify the notation.

9. Explain transmission of dynamometer.

10. Define stability and hunting of governor.

Part – B

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

11. **(a)** An electric motor driven power screw moves a nut in a horizontal plane against a force of 75 kN at a speed of 300 mm/min. The screw has a single square thread of 6 mm pitch on a major diameter of 40 mm. The coefficient of friction at the screw threads is 0.1. Estimate power of the motor. **(5 marks)**

(b) A vertical shaft 150 mm in diameter rotating at 100 r.p.m. rests on a flat end footstep bearing. The shaft carries a vertical load of 20 kN. Assuming uniform pressure distribution and coefficient of friction equal to 0.05, estimate power lost in friction. **(5 marks)**

12. A single plate clutch, with both sides effective, has outer and inner diameters 300 mm and 200 mm respectively. The maximum intensity of pressure at any point in the contact surface is not to exceed 0.1 N/mm2. If the coefficient of friction is 0.3, determine the power transmitted by a clutch at a speed 2500 r.p.m. **(10 marks)**

13. A point on the rim of a rotating wheel originally has a tangential velocity of 12 m/s and a centripetal acceleration of 96 m/s^2. The angular speed of the wheel subsequently is uniformly retarded to 5 rad/s in 4s. For the wheel, estimate (a) the diameter (b) the original angular speed (c) the subsequent angular retardation (d) the tangential acceleration of the point on the rim. **(10 marks)**

14. A simple pendulum of amplitude 4° performs 24 oscillations in one minute. Find (a) length of the pendulum (b) maximum acceleration of the bob, (c) maximum linear velocity of the bob; and (d) maximum angular velocity of the bob. **(10 marks)**

15. A rope drive transmits 600 kW from a pulley of effective diameter 4 m, which runs at a speed of 90 r.p.m. The angle of lap is 160°; the angle of groove 45°; the coefficient of friction 0.28; the mass of rope 1.5 kg/ m and the allowable tension in each rope 2400 N.Find the number of ropes required. **(10 Marks)**

16. A band brake acts on the ¾ th of circumference of a drum of 450 mm diameter which is keyed to the shaft. The band brake provides abraking 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 anticlockwise direction. **(10 Marks)**

17. A centrifugal governor is fitted with two balls each of mass 2·5 kg. Find the height of the governor, when it is running at 75 r.p.m. Also find the speed of the governor, when the balls (a) rise by 20 mm and (b) fall by 20 mm. Neglect friction of the governor. **(5+5=10 Marks)**

* * * * *