

**INDIAN MARITIME UNIVERSITY**  
**(A Central University, Govt. of India)**

**B.Tech (Marine Engineering) - Semester II**  
December 2015 End Semester Examinations

**Engineering Mechanics - II**  
Subject Code:UG11T2206/UG11T1206

Time : 0300 Hrs  
Date : 26.12.2015

Max Marks-100  
Pass Marks-50

---

**Part-A (10x3=30 Marks)**

**Compulsory Questions**

- 1)
- a) Write the laws of dynamic friction.
  - b) Write about the term helix angle in screw friction.
  - c) Define 'D'Alembert's principle.
  - d) What do you understand by the term angular velocity, angular acceleration and angular displacement?
  - e) Write the conditions required for a body to move or vibrate, with simple harmonic motion.
  - f) A mass supported by a spring has a static deflection of 0.5 mm. Determine its natural frequency of oscillation.
  - g) What is centrifugal tension in a belt? How does it affect the power transmitted.
  - h) The following data were recorded in a laboratory experiment with rope brake :  
Diameter of flywheel = 1.2 m; diameter of rope = 12.5 mm; engine speed = 200 r.p.m.; dead load on brake = 600 N, and spring balance reading 150 N. Calculate the brake power of the engine.
  - i) Calculate the vertical height of a Watt governor when it rotates at 60 r.p.m. Also find the change in vertical height when its speed increases to 61 r.p.m.
  - j) Define and explain the following terms relating to governors :  
1. Stability 2. Sensitiveness 3. Hunting.

**Part-B (5x14=70Marks)**

**Answer any five of the followings.**

- 2) A conical friction clutch is used to transmit 90 kW at 1500 r.p.m. The semi-cone angle is  $20^\circ$  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  $0.25 \text{ N/mm}^2$ , find the dimensions of the conical bearing surface and the axial load required. (14)
- 3) Explain with neat diagram the motion of a rolling wheel without slipping. (14)

- 4) A thrust shaft of a ship has 6 collars of 600 mm external diameter and 300 mm internal diameter. The total thrust from the propeller is 100 kN. If the coefficient of friction is 0.12 and speed of the engine 90 r.p.m., find the power absorbed in friction at the thrust block, assuming 1) uniform pressure ; and 2) Uniform wear. (14)
- 5)
- i) A simple pendulum of amplitude  $4^\circ$  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)
  - ii) 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. (4)
- 6) The power is transmitted from a pulley 1 m diameter running at 200 r.p.m. to a pulley 2.25 m diameter by means of a belt. Find the speed lost by the driven pulley as a result of creep, if the stress on the tight and slack side of the belt is 1.4 MPa and 0.5 MPa respectively. The Young's modulus for the material of the belt is 100 MPa. (14)
- 7) Classify the absorption dynamometer and describe the construction and operation. (14)
- 8) A Proell governor has equal arms of length 300mm. The upper and lower ends of the arms are pivoted on the axis of the governor. The extension arms of the lower links are each 80 mm long and parallel to the axis when the radii of rotation of the balls are 150mm and 200mm. The mass of each ball is 10kg and the mass of the central load is 100 kg. Determine the range of speed of the governor. (14)

\*\*\*\*\*