

GANPAT UNIVERSITY

B. Tech. Semester: III (MARINE) Engineering
Regular Examination November / December - 2013
2MR306: ENGINEERING MECHANICS

Time: 3 Hours

Total Marks: 70

- Instruction:** (1) All questions are compulsory.
(2) Assume suitable data if necessary.
(3) Scientific calculator is allowed.

Section - I

- Que. - 1** (1) Define following terms. 04
- (i) Friction
 - (ii) Limiting force of friction
 - (iii) Coefficient of friction
 - (iv) Angle of friction
- (2) Find the force required to drag a body of weight W , placed on a rough inclined plane having inclination α to the horizontal. The force P is applied to the body horizontally and the body is on point of motion up the plane. 04
- (3) Find the force required to move a load of 30N up a rough inclined plane. The force being applied parallel to the plane. The inclination of the plane is such way that when the same body is kept on a perfectly smooth plane inclined at that angle, a force of 6N applied at an inclination of 30° to the plane keeps the same in equilibrium. Assume coefficient of friction between the rough plane and load is equal to 0.3. 04

OR

- Que. - 1** (1) Explain the difference between coefficient of friction and angle of friction. 04
- (2) The mean radius of the screw of a square threaded screw jack is 25mm. the pitch of thread is 7.5mm. If the coefficient of friction is 0.12, when effort applied at the end of lever 60cm length is needed to raise a weight of 2kN. 04
- (3) Drive the condition for maximum efficiency of a screw jack. 04

- Que. - 2** (1) What is a compound pendulum? Derive an expression for the time period of a compound pendulum. 06

- (2) A body moving with simple harmonic motion has amplitude of 1 meter and the period of complete oscillation is 2 seconds. What will be the velocity and acceleration of the body after 0.4 second from the extreme position? 05

OR

- Que. – 2 (1) What is simple pendulum? Derive an expression for the time period of a simple pendulum. 05
- (2) 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. 06

Que. – 3 Attempt any three. 12

- (1) Derive equation of ratio of tensions for belt drive without considering slip of belt.
- (2) Find the power transmitted by a belt running over a pulley of 600mm diameters at 200rpm. The coefficient of friction between the belt and pulley is 0.25, angle of lap 160° and maximum tension in the belt is 2.5kN.
- (3) Derive the equation for centrifugal tension in belt.
- (4) Define following terms for S.H.M
- (i) Amplitude
 - (ii) Oscillation
 - (iii) Beat
 - (iv) Frequency

Section – II

- Que. – 4 (1) Explain the term height of governor. Derive an expression for the height in the case of a watt governor. What are the limitations of a watt governor? 04
- (2) A proell governor has equal arms of length 300mm. the upper and lower arms of the arms are pivoted on the axis of the governor. The extension arms of the lower links are each 80mm long and parallel to the axis when the radius of rotation of the balls are 150mm and 200mm. The mass of each ball is 10kg and the mass of the central load is 100kg. Determine the range of speed of the governor. 04
- (3) What are the effects of friction and of adding a central weight to the sleeve of a watt governor? 04

OR

- Que. – 4** (1) Derive the equation for the height in case of a porter governor. 04
(2) Calculate the vertical height of a watt governor when it rotates at 60rpm. Also find the change in vertical height when its speed increases to 61rpm. 04
(3) Define following terms 04
(i) Stability
(ii) Sensitiveness
(iii) Hunting

- Que. – 5** (1) Establish a formula for the maximum torque transmitted by a single plate clutch of external and internal radius r_1 and r_2 , if the limiting coefficient of friction is μ and the axial spring load is W . Assume that the pressure intensity on the contact-faces is uniform. 05
(2) A conical pivot bearing supports a vertical shaft of 200mm diameter. It is subjected to a load of 30kN. The angle of the cone is 120° and the coefficient of friction is 0.025. Find the power lost in friction when the speed is 140rpm. Assuming (i) Uniform pressure, (ii) Uniform wear. 06

OR

- Que. – 5** (1) Derive equation for total frictional torque of a flat pivot bearing. Assuming (i) Uniform pressure, (ii) Uniform wear. 05
(2) Determine the maximum, minimum and average pressure in plate clutch when the axial force is 4kN. The inside radius of the contact surface is 50mm and the outside radius is 100mm. Assuming uniform wear. 06

Que. – 6 Attempt any three.

- (1) Discuss briefly the various types of belts used for the transmission of power. 04
(2) How does the velocity ratio of a belt drive effect, when some slip is taking place between the belt and the two pulleys? 04
(3) What are the advantages of a rope drive? Derive the equation for ratio of tensions in rope drive. 04
(4) Thrust shaft of a slip has 6 collars of 600mm external diameter and 300mm internal diameter. The total thrust from the propeller is 100kN. If the coefficient of friction is 0.12 and speed of the engine is 90rpm. Find the power absorbed in friction at the thrust block. Assuming (i) Uniform pressure, (ii) Uniform wear. 04

END OF PAPER