



INDIAN MARITIME UNIVERSITY

B.Tech (MARINE ENGINEERING)
June 2013 Examinations

SECOND SEMESTER
ENGINEERING MECHANICS - II

Old Subject Code: UG/ME/BS/T/126
Date: 22.06.2013
Time: 3 Hrs

QP Code: T0511206
Max. Marks: 100

Part - A

(3 x 10 = 30 Marks)

Answer all the questions

- 1) (a) State the laws of (i) Solid friction and (ii) Fluid friction.
- (b) A vertical shaft 150mm in diameter rotating at 100r.p.m. rests on a flat end footstep bearing. The shaft carries a vertical load of 20kN. Assuming uniform pressure distribution and coefficient of friction equal to 0.05, estimate power lost in friction.
- (c) A body moves along a straight line so that its displacement from a fixed point on the line is given by $S = 4t^3 - 6t^2 + 20$. Find the displacement, velocity and Acceleration at the end of 3 Seconds.
- (d) State Newton's first, second and third law of motion.
- (e) Define the terms amplitude, periodic time, and frequency as applied to S.H.M.
- (f) Explain the phenomena of 'slip' and 'creep' in a belt drive.
- (g) What is centrifugal tension in a belt? How does it affect the power transmitted?
- (h) Write down the expression for the ratio of maximum and minimum tensions in the band and block brake.
- (i) What is the function of governor? How does it differ from that of a flywheel?

(j) What is co-efficient of insensitiveness of governors?

Part - B

(5 x 14 = 70 Marks)

Answer any five questions

- 2) The mean diameter of a square threaded screw jack is 50mm. The pitch of the thread is 10mm. The coefficient of friction is 0.15. What force must be applied at the end of a 0.7m long lever, which is perpendicular to the longitudinal axis of the screw to raise a load of 20kN and to lower it? (14)
- 3) The rotation of 1m rod OA, shown in Fig.1 is defined by $\theta = 0.5t^2$ where θ is expressed in radians and t in seconds. A block B on the rod OA, slides along the rod in such a way that its radial distance from O is $r = 1 - 0.12t^2$ where r is expressed in meters and t in sec.

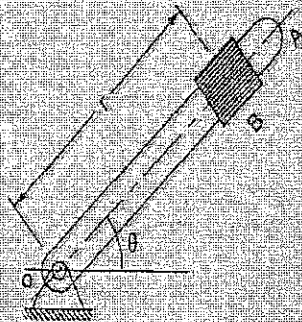


Fig. 1

Determine the resultant velocity and resultant acceleration of block B when the rod has rotated through 45° . (14)

- 4) (a) A point moves with a simple harmonic motion. When this point is 0.75 m from the mid path, its velocity is 11 m/s and when 2 m from the centre of its path its velocity is 3 m/s, find its angular velocity, periodic time and its maximum acceleration. (8)
- (b) Derive an expression for the period of a mass when attached to a helical spring. (6)

- 5) A compressor, requiring 90kW is to run at about 250 r.p.m. The drive is by V-belts from an electric motor running at 750 r.p.m. The diameter of the pulley on the compressor shaft must not be greater than 1 m while the centre distance between the pulleys is limited to 1.75 m. The belt speed should not exceed 1600m/min. Determine the number of V-belts required to transmit the power if each belt has a cross sectional area of 375mm^2 , density 1000 kg/m^3 and an allowable tensile stress of 2.5MPa. The groove angle of the pulley is 35° . The coefficient of friction between the belt and the pulley is 0.25. Calculate also the length required of each belt. (14)
- 6) (a) Describe with of a crony brake absorption dynamo meter and explain with detailed calculation involved in finding the brake power of the engine. (10)
- (b) In the petrol Engine Experimental set up the diameter of the fly wheel and rope is 1.2 m and 12.5 mm respectively. The Engine runs at 200 r.p.m and dead load on the brake is 600 N. Spring balance reading is 150 N. Calculate the brake power of the Engine. (04)
- 7) A Porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the range of speed, sleeve lift, governor effort and power of the governor, when the friction at the sleeve is equivalent to 10 N. (14)
- 8) Explain the term height of the governor, and derive an expression for the height in case of a Porter governor. (14)
