INDIAN MARITIME UNIVERSITY

(A Central University, Govt. of India)

End Semester Examinations –June-July 2019

B. Tech (Marine Engineering)

Semester-II

Engineering Mechanics II

(UG11T3206)

Date: 06-07-2019	**Max Marks: 100**
Time: 03 Hrs.	**Pass Marks: 50**

PART – A Marks: 10X3=30

(All questions are compulsory)

Q.1

(a) State the laws of dry friction.

(b) Define overhauling and self locking of screws.

(c) Define terms height of governor and sleeve lift in governor.

(d) What is the effect of slip on velocity ratio of belt drive? List the expression for velocity ratio with slip on both driver and driven pulleys.

(e) A body is vibrating with SHM of amplitude 100mm and frequency 2 per sec. Calculate maximum velocity and maximum acceleration.

(f) Define stability and hunting of governors.

(g) What is initial tension in a belt and how does it affect power transmitted?

(h) List the two theories for calculating friction torque in bearings/ clutches? Briefly explain which one is to be used for friction loss in bearings?

(i) What are the advantages of using 'V' belt drive?

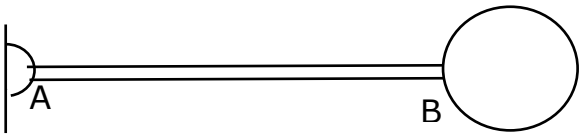
(j) Explain with expression which side, lower or upper, in a horizontal open belt drive should be tight and why?

PART – B Marks: 5X14=70

(Answer any 5 of the following)

Q2. A single plate clutch transmits 25kW power at 900 rpm. The maximum pressure intensity between the plates is 85kN/m^2. The outer diameter of the plate is 360mm. Both the sides of the pate are effective. Coefficient of friction is 0.25. Determine the inner diameter of the plate of clutch. (14)

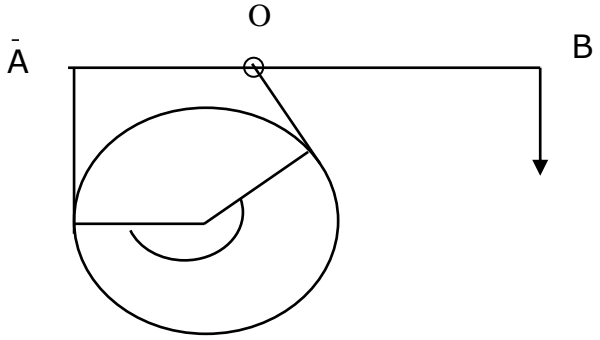
Q3 (a) A homogenous heavy metal ball of radius 0.14m and weight 97.5kg is connected with a slender rod AB of weight 23kg. Length AB = 0.6m. A rotation is applied on this system with angular speed 9 rad/s. Compute the magnitude of the angular acceleration of the system. Also find the reaction at hinge point A. (4+3=7)



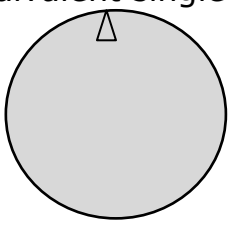
(b) A flywheel of 15kg mass and 20cm radius of gyration is directly coupled to an electric motor which can develop 10kW power when rotating at a speed of 1200 rpm. Determine the driving torque to maintain the speed. If power is switched off and flywheel comes to rest in 25 seconds, determine the uniform retarding torque on the flywheel. (3+4=7)

Q4. A screw jack raises a load of 16kN through a distance of 150mm. The mean diameter of screw is 56mm and pitch 10mm. Determine the work done and efficiency of the screw jack when
(a) Load rotates with the screw.
(b) Loose head on which load rests does not rotate with screw. The outside dia and inside dia of the bearing surface of loose head are 50mm and 10mm respectively. Coefficient of friction for the screw and bearing surface is 0.11
(7+7=14)

Q5. A simple band brake is applied to a shaft carrying a flywheel of 250kg mass and radius of gyration of 300mm. The shaft speed is 250rpm and rotating anticlockwise. The drum diameter is 200mm and coefficient of friction is 0.25. O is fulcrum. Take AO = 100mm and OB = 280mm. Lap angle of band shown is 225^{o}. Determine
(a) Braking torque when 120N force is applied at the end of lever B
(b) Number of turns the flywheel will make before coming to rest and
(c) Time taken by flywheel to come to rest. (8+3+3 = 14)



Q6 (a) A metallic disc of 1m diameter is mounted at its outer edge as shown below. Determine the time period for small oscillations. Also determine the length of equivalent single pendulum. (4+3 =7)



(b) A horizontal platform executes simple harmonic motion horizontally. It oscillates over a distance of 2m and makes 10 complete oscillations per minute. Determine the least value of coefficient of friction between the platform and a heavy block placed on it to prevent the block from slipping. (7)

Q7. An open belt drive is required to transmit 10kW power from a motor running a 600rpm. Diameter of driving pulley is 250mm. The speed of driven pulley is 220 rpm. The belt is 12 mm thick and has a density of $0.001 g/mm^3$. Safe stress in the belt is not to exceed $2.6 N/mm^2$. The two shafts are 1.25m apart. The coefficient of friction is 0.25. Determine the width of the belt.
(14)

Q8. (a) Explain functioning of a simple Watt governor and derive equation relating speed and height of governor. Why is it not effective at high speeds?
(4+2 = 6)

(b) The arms of a Porter governor are each 250 mm long and pivoted on the governor axis. The mass of each ball is 5 kg and the mass of the central sleeve is 30 kg. The radius of rotation of the balls is 150 mm when the sleeve begins to rise and reaches a value of 200 mm for maximum speed. Determine the speed range of the governor. OA=OB=AC=BC=250mm (8)