INDIAN MARITME UNIVERSITY

DEPARTMENT OF MARINE ENGINEERING

SEMESTER III – JULY 2012 EXAMINATION

T/126 ENGINEERING MECHANICS II

Time: 3 HRS **Maximum Marks: 100**

PART - A

(3 x 10 = 30 Marks)

Compulsory Question

1. a. State the laws of dynamic friction
   b. Define over hauling and self locking of screws.
   c. Write the equation of kinetic energy of translation and rotation
   d. Define Torque. Write the unit of Torque.
   e. Define compound pendulum and centre of percussion.
   f. Write the types of dynamometers.
   g. What are the advantages of Fibre Rope drive?
   h. What is centrifugal tension in belt?
   i. Define sensitiveness of governors.
   j. Define stability and hunting of governors.

PART - B

(5 x 14 = 70 Marks)

Answer any five of the following

2. The thrust of a propeller shaft in a marine engine is taken up by a number of collar integral with the shaft which is 300 mm in diameter. The thrust on the shaft is 200 KN and the speed is 75 r.p.m. Taking μ constant and equal to 0.05 and assuming intensity of pressure as uniform and equal to 0.3 N/mm2, find the external diameter of the collars and the number of collars required, if the power lost in friction is not to exceed 16 KW. (14)

3. An open belt drive connects two pulleys 1.2 m and 0.5 m diameter, on parallel shafts 4 metres apart. The mass of the belt is 0.9 kg per metre length and the maximum tension is not to exceed 2000 N.Thecoefficient of friction is 0.3. The 1.2 m pulley, which is the driver, runs at 200 r.p.m. Due to belt slip onone of the pulleys, the velocity of the driven shaft is only 450r.p.m. Calculate the torque on each of thetwo shafts, the power transmitted, and power lost in friction. What is the efficiency of the drive? (14)

4. In a winch, the rope supports a load W and is wound round a barrel 450 mm diameter. A differential band brake acts on a drum 800 mm diameter which is keyed to the same shaft as the barrel. The two ends of the bands are attached to pins on opposite sides of the fulcrum of the brake lever and at distances of 25 mm and 100 mm from the fulcrum. The angle of lap of the brake band is 250° and the coefficient of friction is 0.25. What is the maximum load W which can be supported by the brake when a force of 750 N is applied to the lever at a distance of 3000 mm from the fulcrum? (14)

5. The arms of a porter governor are 300 m long. The upper arms are pivoted on the axis of rotation. The lower arms are attached to a sleeve at a distance of 40 mm from the axis of rotation. The mass of the load on the sleeve is 70 kg and the mass of each ball is 10 kg. Determine the equilibrium speed when the radius of rotation of the balls is 200 mm. If the friction is equivalent to a load of 20 N at the sleeve, what will be the range of speed for this position? (14)

6. The following particulars refer to a Proell governor with open arms : Length of all arms = 200 mm; distance of pivot arms from the axis of rotation = 40 mm; length of extension of lower arms to which each ball is attached = 100 mm; mass of each ball = 6 kg and mass of central load = 150 kg. If the radius of rotation of the balls is180 mm when the arms are inclined at an angle of 40° to the axis of rotation, find the equilibrium speed for the above configuration. (14)

7. The pendulum of an Izod impact testing machine has a mass of 30 kg.Its centre of gravity is 1.05 m from the axis of suspension and the striking knife is 150 mm below the centre of gravity. The time for 20 small free oscillations is 43.5 seconds. In makinga test the pendulum is released from an angle 60° to the vertical. Determine

1. the position of the centre of percussion relative to the striking knife and the striking velocity of the pendulum, and
2. The impulse on the pendulum and the sudden change of axis reaction when a specimen giving an impact value of 55 N-m is broken. (14)

8. A road roller has a total mass of 12 tones. The front roller has a mass of 7 tones, a radius of gyration of 0.4 m and a diameter of 1.2 m. The rear axle, together with its wheels, has a mass of 2.5 tones, a radius of gyration of 0.6 m and a diameter of 1.5 m.

Calculate :-

1. Kinetic energy of rotation of the wheels and axles at a speed of 9 km/h,
2. Total kinetic energy of road roller, and 3. Braking force required to bring the roller to rest from 9 km/h in 6 m on the level (14)

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