INDIAN MARITIME UNIVERSITY

(A CENTRAL UNIVERSITY, GOVERNMENT OF INDIA)

B.TECH (MARINE ENGINEERING)

DECEMBER2014/JANUARY END SEMSTER EXAMINATION

II SEMESTER

ENGINEERING MECHANICS – II (T 2206 / T 1206)

Time: 03.00 Hrs. Max. Marks: 100

Date:16-12-2014 Pass Marks: 50

Part - A (3×10 = 30 Marks)

Compulsory Questions

1.

a) Define Limiting Friction and Cone of friction?

b) Explain the phenomenon of "Creep" in a belt drive.

c) A body is moving with SHM has an amplitude of 1.2m and a periodic time of 3 s. Calculate the velocity and acceleration when the body is displaced 0.6 m from its mid position.

d) Define the terms: Effort and Power of a Governor.

e) Define the law of Isochronisms as applied to simple pendulum.

f) Distinguish between Fly wheel and Governor.

g) A body of weight 100N is placed on a rough horizontal plane. Determine the coefficient of friction when a horizontal pull of 20 N is applied on the body.

h) Explain "Initial Tension" in a belt drive.

i) State the effect on velocity ratio of belt drive to "Slip".

j) State the useful and harmful effects of friction.

Part - B (5×14 = 70 Marks)

Answer Any Five of the following

2. a) Show that the minimum periodic time of a compound pendulum is:

$$T_{p(min)} = 2\pi\sqrt{(k_G/l)}$$ [Where k_G is the radius of gyration about the centre of gravity]

b) What is the length of the simple pendulum which gives the same frequency as compound pendulum.

[10+4=14]

3. In a screw Jack has a thread of 36mm mean diameter and a pitch of 6 mm. It is of V- form with an inclined angle of 55^0 and the coefficient of friction is 0.15. If the jack supports a load of 8 kN, find the torque required to (a) raise the load and (b) lower the load.

[14]

4. An open belt connects two flat pulleys. The smaller pulley is 0.25 m in diameter and runs at 200 rpm. The angle of Lap on the pulley is 160^0 and the coefficient of friction between belt and pulley is 0.25. The belt is on the point of slipping when 10 kW is being applied. Which of the following alternatives would be more effective in increasing the power which could be transmitted?
(a) increasing initial tension in the belt by 10% ?
(b) increasing coefficient of friction by 10% by application of suitable dressing ?[14 marks]

5. A vertical shaft 150 mm in diameter rotating at 100 rpm rests on a flat pivot bearing. The shaft carries a load of 20 kN, the coefficient of friction is 0.05. Estimate the power lost in friction (a). assuming uniform pressure (b) assuming uniform wear. [14 marks]

6. The arms of a Porter governor has equal arms are each 250 mm long and pivoted on the governor axis. Each ball has a mass of 6 kg and the mass of central load on the sleeve is 18 kg. The radius of rotation of the ball is 150mm when the governor begins to lift and 200mm when the governor is at maximum speed. Find the maximum and minimum speeds and also range of speed of governor. [14 marks]

7. (a) Prove the equation of braking torque of a band brake = $T_B = (T_1 - T_2)r_e$ [Where T_1 and T_2 are tension in tight and slack side of the band respective, r_e is effective radius of drum]
(b)What is a self locking brake?
[10+4=14]

8. The thrust of a Propeller shaft in a Marine Engine is taken up by 8 collars whose external and internal diameters are 600 mm and 300 mm respectively. The total thrust from the propeller is 100 kN. If the Coefficient of friction is 0.12 and speed of the engine 90 rpm, find the power developed in friction of thrust block, assuming i). uniform pressure; and ii) uniform wear.
[14 marks]

9. A rope drive is required to transmit 35 kW at 160 rev/min. The grooved pulley has a mean diameter to the rope centre of 1.2 m and the groove angle is 45^0. Taking the coefficient of friction as 0.25 and the arc of contact of the ropes as 109^0, determine the number of ropes required if the greatest pull is limited to 700 N. [14 marks]