

**INDIAN MARITIME UNIVERSITY**  
(A Central University, Govt. of India)

**May/June 2015 End Semester Examinations**

**SEMESTER – II, B.TECH ( MARINE ENGINEERING)**

**ENGINEERING MECHANICS - II (T 2206 / T 1206)**

**Date: 22.06.2015**  
**Time: -3 Hrs**

**Max. Marks: 100**  
**Pass Marks: 50**

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**PART – A**  
**(Compulsory Questions)**

**(3 x 10 = 30 Marks)**

1. a) Explain angle of repose and impending motion?
- b) Explain the phenomenon of “Slip” in a belt drive .
- c) Define “D’Alembert’s Principle.
- d) A body of weight 500N is lying on a rough horizontal surface having a coefficient of friction 0.3. If it is subjected to a force P, applied at  $20^\circ$  with horizontal, determine the frictional force F developed in the surface
- e) Define maximum and minimum equilibrium speeds of a governor
- f) Explain the terms: Amplitude and Periodic Time as applied to SHM
- g) Explain “Creep” in a belt drive.
- h) Distinguish between Brake and Dynamometer.
- i) Define Torque and state its unit
- j) Define “Hunting ” of a “Governor”

**PART – B**  
**(Answer any five of the following)**

**(5 x 14 = 70 Marks)**

2. a) In a screw Jack the helix angle of thread is  $\alpha$  and the angle of friction is  $\phi$ . Show that its efficiency for up motion i.e., against the load is maximum when  $2\alpha = (90^\circ - \phi)$
- b) A 60 mm diameter shaft running in a journal bearing carries a load of 2000N. If the coefficient of friction between the shaft and bearing is 0.03, find the power transmitted when it runs at 1440 r.p.m. **(8+ 6=14)**

3. A point moves with simple harmonic motion. When this point is 0.75 metre from the mid path, its velocity is 11 m/s and when 2 metres from the centre of its path, its velocity is 3 m/s. Find its angular velocity, periodic time and its maximum acceleration.  
(6+4+4=14)
4. Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart, and are connected by a crossed belt. Find the length required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN and the coefficient of friction between belt and pulley is 0.25 ?  
(6+4+4= 14)
5. A Porter governor has equal arms 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 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the maximum and minimum speeds and also range of speed. of governor  
(14)
6. 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)
7. A single plate clutch, with both sides effective, has outer and inner diameters 300 mm and 200 mm respectively. The maximum intensity of pressure at any point in the contact surface is not to exceed  $0.1 \text{ N/mm}^2$ . If the coefficient of friction is 0.3, determine the power transmitted by a clutch at 2700 r.p.m. ( assume Constant for Uniform Wear =  $10 \text{ N/mm}$  )  
(14)
8. a) Deduce the relation between the tensions in the tight and slack sides of a belt connecting two pulleys and transmitting power. Neglect the centrifugal effect of the belt mass.  
b) In a laboratory experiment, the following data recorded with rope brake dynamometer: Diameter of the flywheel 1.4 m; diameter of the rope 14.5 mm; speed of the engine 200 r.p.m; dead load on the brake 600 N; spring balance reading 150N. Calculate the brake power of the engine.  
(8+ 6=14)
9. a) A small flywheel is suspended in a vertical plane as a compound pendulum. The distance of centre of gravity from the knife edge support is 100 mm and the flywheel make 120 oscillations in 174 seconds. Find the mass of the flywheel if the mass moment of inertia of the flywheel through the centre of gravity is  $3.6 \text{ kg-m}^2$   
b) What is the equivalent length of the simple pendulum which gives the same frequency as compound pendulum  
(10+ 4=14)

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