

Indian Maritime University

(A Central University, Govt of India)

May-June 2018 End Semester Examinations

B. Tech (Marine Engineering)

Semester-III

MACHANICS OF MACHINE –I (UG11T1305/UG11T2305)

Date: 11.07.2018

Max Marks: 100 Marks

Time: 3 Hrs

Pass Marks: 50 Marks

Part – A

(All Questions are compulsory)

Marks: $10 \times 3 = 30$

1.
 - a) Explain function of flywheel and fluctuation of energy of Flywheel
 - b) Define Kinematic Chain and explain Kinematics.
 - c) Explain instantaneous centre method.
 - d) Explain with suitable sketches different type of follower in contact with surface of cam.
 - e) Explain with sketch the manner of constraint of follower with cam.
 - f) In a roller type follower with radial cam explain base circle, pitch circle, pressure angle and cam profile.
 - g) Generally what type of tooth profile are used in gears for transmission of power and why?
 - h) In a gear, draw base circle, pitch circle, addendum circle and dedendum circle, show addendum and dedendum height and their normal value in terms of module.
 - i) Draw base circles and pitch circles of a pair of gears and define pressure angle and show normal force acting on meshing teeth.
 - j) A top (toy) having weight 'W' is spinning about its geometric axis at pivot point 'O' on floor, making an angle 25° with vertical but it is not falling, explain why? Show mutually perpendicular relevant vector in plan and elevation view.

Part – B

(Answer any 5 of the following 7 questions)

Marks: 5 X 14 = 70

2. The turning moment diagram of an engine is drawn to the following scale: Turning moment, 1mm = 5Nm; crank angle 1mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine. The areas above and below the mean turning moment from one end are taken in order (+) 310, (-) 700, (+) 60, (-) 320 (+) 950, (-) 300mm². The rotating parts are equivalent to a mass of 55Kg at a radius of gyration 180mm. Determine the coefficient of fluctuation of speed when the engine runs at 2000rpm. If the mean turning moment is 900Nm, find the coefficient of fluctuation of energy. [14]

3. The crank pin circle radius of a horizontal engine is 250mm. The mass of reciprocating parts is 200kg, and the crank has travelled 60° from inner dead centre. The difference between driving and back pressure is 0.35 N/mm². The connecting rod length between the centre is 1.0m and cylinder bore 0.4 m. If the engine runs at 300 rpm and if the effect of piston rod diameter is neglected, calculate (i) pressure on slide bars (2) Thrust in connecting rod (3) Tangential force on crank pin (4) Turning moment on crank shaft. (5) Radial force passing along crank. [14]

4. Draw the profile of a radial cam operating with a roller type follower having a lift of 50mm. The outstroke of the follower is S.H.M. for 150° cam rotation followed by dwell of 50°. The follower returns with uniform velocity for the next 130° rotation of cam, again followed by dwell period. The cam rotates at 90 rpm, base circle diameter 60mm and roller diameter is 10mm. What is the diameter of the prime circle? Find the maximum velocity and acceleration of the follower both in outstroke and return stroke. [14]

5. The speed ratio of a pair of spur gear is 4:1. The teeth are involute profile, module is 5mm. addendum is one module, pressure angle is 20° . The pinion rotates at 100 rpm. Determine (i) no of teeth of pinion and gear to avoid interference (ii) The length of path of contact and arc of contact (iii) Contact ratio (iv) maximum sliding velocity. [14]
6. When in mesh two gear wheels with 100 and 25 teeth of involute profile rotate in opposite direction at pressure angle of 20° , module of 6mm and a contact ratio of 1.5. The arc of recess is 1.15 times the arc of approach. The pinion runs at 2000 rpm and transmit 5Kw. Determine (i) The addendum of two gears (ii) Maximum velocity of sliding (iii) Normal force between a pair of mating teeth, neglecting effect of friction [14]
7. a) Draw a sketch of pair of helical gear and build up a relation of helix angle with axial pitch, circular pitch, normal pitch, lead. Define normal pressure angle and normal module.
b) Draw a sketch of worm and worm wheel and explain helix angle, lead angle. Describe operation of worm and worm wheel. [7+7]
8. A turbine of rotor on a ship has mass of 25 tonne and radius of gyration is 500 mm. It rotates at 2500 rpm in anticlockwise direction looking from aft. The ship pitches in S.H.M. at 6 degree above and 6 degree below the horizon and time period is 12 sec. Determine (a) maximum gyroscopic couple. (b) Maximum angular acceleration of pitching, (c) Analyse with vector diagram the direction in which the bow will tend to turn while rising. [14]
