

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

May/June 2015 End Semester Examinations

SEMESTER – III, B.TECH (MARINE ENGINEERING)

MECHANICS OF MACHINE - I (T 2305 / T 1305)

Date: 20.06.2015

Time: -3 Hrs

Max. Marks: 100

Pass Marks: 50

PART – A **(3 x 10 = 30 Marks)**
(Compulsory Questions)

1. a) Define coefficient of fluctuation of speed and energy of flywheel.
- b) Explain Kinematics and dynamics of machine.
- c) Explain rubbing velocity at pin joint.
- d) Show with sketch different type of follower of cams.
- e) Explain with sketch type of constraint of follower with cam.
- f) Draw suitable sketches of cam with follower based on type of movement of follower and line of motion of follower.
- g) Draw a suitable sketch and express the relation between base circle, pitch circle and pressure angle of a involute profile tooth of a pair of gears.
- h) Explain circular pitch, diametrical pitch, module, addendum and dedendum of a gear.
- i) Draw a sketch of herring bone gears and explain its advantage.
- j) Draw mutually perpendiculars three vectors with respect to gyroscopic motion of a suspended spinning flywheel and explain all relevant vectors and their inter-relation.

PART – B **(5 x14 = 70 Marks)**
(Answer any five of the following)

2. In a slider Crank Mechanism, the length of the crank and connecting rod are 200 mm and 700 mm respectively. The crank position is 60° from inner dead centre. The crank shaft speed is 600 rpm (clockwise). Using an analytical method determine **(14)**
(i) velocity and acceleration of slider (ii) Angular velocity of Connecting rod.
3. The crank pin circle radius of a horizontal engine is 250mm. The mass of reciprocating parts are 200 kg. and the crank has travelled 60° from inner dead centre. The difference between driving and back pressure is 0.35 N/mm^2 . The connecting rod length between the centre is 1.0m and cylinder bore 0.4 m. If the engine runs at 250 rpm and if the effect of piston rod diameter is neglected, calculate **(14)**
(1) pressure on slide bars (2) Thrust in connecting rod
(3) Tangential force on crank pin (4) Turning moment on crank shaft.
4. Draw a profile of a radial cam operating with knife edge follower having lift of 40mm. The out stroke of follower is S.H.M. for 160° cam rotation followed by a dwell of 40° . The follower returns with also S.H.M, for next 120° rotation of cam, again followed by dwell period. The cam rotates at 150 rpm and base circle diameter is 50mm. Find also maximum velocity and acceleration of follower both in out stroke and return stroke. **(14)**
5. Draw a sketch of displacement, velocity and acceleration diagram of uniform acceleration and deceleration of follower. Derive relation of maximum velocity and acceleration of follower with relevant parameters for out stroke and return stroke. **(14)**
6. Two involute gears of 20° pressure angle are in mesh. The number of teeth of pinion is 20 and gear ratio is 2. If module is 5 mm and pitch line speed is 1.2 m/sec, addendum is one module find (i) The angle turned through pinion when one pair of teeth is in mesh (2) maximum velocity of sliding. **(14)**

7. 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. **(14)**
8. a) Draw and explain different type of general gear train and show the relation between speed and number of teeth of input gear and output gear.
- b) Draw a suitable sketch of epicyclic gear train and find velocity ratio between input and output. **(7+7)**
9. The mass of a turbine rotor of a ship is 30 tonne and has radius of gyration of 700mm. The turbine rotate at 3000 rpm in clock wise direction looking from aft. The ship pitches through 7° above and 7° below the horizontal position, the motion being S.H.M. having time period 15 sec. Determine (i) Maximum gyroscopic Couple, (ii) maximum angular acceleration of pitching, (iii) by showing proper vector diagram show the direction in which the bow will tend to turn while rising. **(14)**
