

INDIAN MARITIME UNIVERSITY
(A CENTRAL UNIVERSITY, GOVERNMENT OF INDIA)
B.TECH (MARINE ENGINEERING)
DECEMBER 2014/JANUARY 2015 END SEMSTER EXAMINATIONS
III SEMESTER
MECHANICS OF MACHINES – I (T 2305 / T 1305)

Time : 3.00 Hrs
Date:02-01-2015

Max Marks : 100
Pass Marks : 50

Part - A (3x10 = 30 Marks)

Compulsory Question

1.
 - a) Explain function of fly wheel and fluctuation of energy.
 - b) Define Kinematic Chain.
 - c) Explain instantaneous centre method.
 - d) Explain with suitable sketches, different types 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, prime circle and pressure angle.
 - 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 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 30° with vertical but is not falling, explain why?

PART – B (5 X 14 = 70 Marks)

Answer any five of the following

2.
 - a) Express coefficient of fluctuation of speed and coefficient of fluctuation of energy. Draw a turning moment diagram of a petrol engine. [7]
 - b) The turning moment diagram of a engine is drawn to the following scale: Turning moment, 1mm = 5mm; 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 (+) 305, (-) 695, (+) 50, (-) 350, (+) 970, (-) 280mm². The rotating parts are equivalent to a mass of 50 Kg at a radius of gyration 170 mm. Determine coefficient of fluctuation of speed when engine runs at 2500 rpm. [7]

3. The crank pin circle radius of a horizontal engine is 300mm. The mass of reciprocating parts are 250 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 1.2m and cylinder bore 0.5 m. If the engine runs at 250 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. a) Draw a sketch of displacement, velocity and acceleration diagram of uniform velocity of follower. Explain the reason of using modified uniform velocity of follower. [5]
 b) Draw displacement, velocity and acceleration diagram of follower having simple harmonic motion. Derive the relation of maximum velocity and acceleration of follower with relevant parameters for out stroke and return stroke. [9]
5. a) Draw profile of radial cam operating with roller type having lift 45mm. The out stroke of follower is S.H.M. for 160° cam rotation followed by dwell of 40° . The follower returns with uniform velocity for next 130° rotation of cam, again followed by dwell period. The cam rotates at 100 rpm, base circle diameter 50 mm and roller diameter is 10mm. what is the diameter of prime circle? [8]
 b) Find maximum velocity and acceleration of follower both in out stroke and return stroke. [6]
6. The speed ratio of a pair of spur gear is 3:1. The teeth are in involute profile, module is 4 mm. addendum is one module, pressure angle is 20° . The pinion rotates at 150 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]
7. When in mesh two gear wheels with 95 and 20 teeth of involute profile rotate in opposite direction at pressure angle of 20° , module of 4mm and a contact ratio of 1:5. The arc of recess is 1.2 times the arc of approach. The pinion runs at 2000 rpm and transmit 4Kw. 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]
8. 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]
9. a) One of the driving axels of a locomotive with its two wheels, has moment of inertia of 400 kgm^2 . The wheels are of 1.6m diameter. The distance between plane of wheels is 1.5m. When travelling at 80 km/hr, the locomotive passes over a defective rail which causes right hand wheel to fall 10 mm and rise again in total time of 0.2 sec, the vertical movement is S.H.M. Find maximum Gyroscopic Couple. [7]
 b) Explain with sketches the stabilization of ship in rolling and pitching with help of gyroscope. [7]
