15. a. The flywheel of a steam engine has a radius of gyration of 1 m and mass 2500 kg. The starting torque of the steam engine is 1500 N-m and may be assumed constant. Determine
    (i) the angular acceleration of the flywheel and
    (ii) the kinetic energy of the flywheel after 10 seconds from the start.

(OR)

b. A rotating shaft carries four unbalanced masses 18 kg, 14 kg, 16 kg and 12 kg at radii 30 mm, 40 mm, 50 mm, 60 mm respectively. The 2nd, 3rd, 4th masses revolve in planes 80 mm, 160 mm, 280 mm respectively measured from the plane of the first mass and are located at 60°, 135°, 270° respectively measured clockwise from the first mass looking from this mass end of the shaft. The shaft is dynamically balanced by two masses, both located at 50 mm radii and revolving in planes midway between those of 1st to 2nd and 3rd to 4th masses. Determine graphically or otherwise the magnitudes of the masses and their respective angular positions.

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Reg. No.										

B.Tech. DEGREE EXAMINATION, NOVEMBER 2013
Fourth Semester

ME0208 – MACHINES AND MECHANISMS
(For the candidates admitted from the academic year 2007-2008 to 2012-2013)

Time: Three hours Max. Marks: 100

Answer **ALL** Questions

PART – A (10 × 2 = 20 Marks)

1. Define structure.
2. List out and give examples for atleast two types of links.
3. What is meant by hook joint? What are its types?
4. What are the different types of motion with which a follower can move?
5. State the law of static friction.
6. Define Self locking of screw jack.
7. Define diametral pitch of a gear.
8. State law of gearing with the aid of neat sketch.
9. List out the conditions for dynamic equilibrium.
10. Differentiate between flywheel and governor.

PART – B (5 × 16 = 80 Marks)

11. a. The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 rpm. The crank is 150 mm and the connecting rod is 600 mm long. Determine
    (i) Linear velocity and acceleration of the midpoint of the connecting rod and
    (ii) Angular velocity and acceleration of the connecting rod at a crank angle of 45° from inner dead centre position.

(OR)

b. The following data refers to a four bar mechanism O_1ABO_2:
Length of fixed link O_1O_2 = 450 mm
Length of input link O_1A = 100 mm
Length of the coupler AB = 400 mm
Length of the output link O_2B = 175 mm
Speed of driver = 220 rpm (clockwise)
Find the angular velocity and acceleration of coupler AB, when the inclination of input link is 60° from the fixed link. Locate all the instantaneous centres.

12. a. Briefly explain about the steering gear mechanism and types.

(OR)

b. The following data refer to a cam with roller follower.
Radius of roller = 10 mm
Minimum radius of cam = 50 mm
Follower to move outward with SHM through a distance of 40 mm during 60° of rotation.
Follower to dwell for 30° of cam rotation.
Follower to return to its initial position with uniform acceleration and retardation motion during 90° of cam rotation. Follower to dwell for remaining 180° of cam rotation line of stroke of follower passes through the axis of cam. Draw the cam profile.

13. a. A screw jack has a square thread of mean diameter 60 mm and pitch 10 mm. The coefficient of friction at the screw thread is 0.09. A load of 4 kN is to be lifted through 120 mm. Determine the torque required and the work done to lift the load through 120 mm. Find the efficiency of the jack also.

(OR)

b. A cone clutch is used to connect a electric motor running uniformly at 500 rpm with a stationary flywheel. The semicone angle of a clutch is 12° and mean diameter of contact surface is 150 mm. The axial force applied is 250 N. Assume coefficient of friction as 0.25. The mass moment of inertia of flywheel is 1 kg-m^2. Determine
(i) Torque required to produce slipping of the clutch.
(ii) Time required to attain full speed.
(iii) Energy lost during slipping period of the clutch.
(iv) Total energy supplied during slipping period of the clutch.

14. a. The mass of the turbine rotor of a ship is 20 tonnes and has a radius of gyration of 0.60 m. Its speed is 2000 rpm. The ship pitches 6° above and 6° below the horizontal position. A complete oscillation takes 30 seconds and the motion is simple harmonic. Determine the following:
(i) Maximum gyroscopic couple
(ii) Maximum angular acceleration of the ship during pitching.
(iii) The direction in which the bow will tend to turn when rising, if the rotation of the rotor is clockwise when looking from the left.

(OR)

b. In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D-E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 rpm clockwise.