Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH (MECHANICAL ENGINEERING)
END SEMESTER EXAMINATIONS, JUNE/JULY 2016

SUBJECT: DYNAMICS OF MACHINERY [MME 2203]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. Fig.Q1A shows a Riveter mechanism. A known force P = 100N is applied on slider link 2. Determine the force Q that must be applied on slider link 6 to maintain static equilibrium. **05**

1B. For the four bar mechanism shown in fig. Q1B, find the horizontal force F that must be applied at the midpoint of link 2 for maintaining static equilibrium. Instead of a force on link 2, if link 2 is a driving crank, find the torque 'T' that must be applied for maintaining static equilibrium. Also find the pin forces. O_2A = 100 mm, AB = 170 mm, O_4B = 170 mm, O_4C = 90 mm, AD = 80 mm,O_2O_4 = 250 mm **05**

2A. Define the following **05**

i) Height of governor ii) Sensitiveness of a governor iii) Stability
iv) Hunting of a governor v) Isochronism

2B. Each ball of a Porter governor has a mass of 6 kg and the mass of the sleeve is 35 kg. The upper arms are 250 mm long and are pivoted in the axis of rotation whereas the lower arms are 200 mm long and are attached to the sleeve at a distance of 35 mm from the axis. Determine the equilibrium speed of the governor for a radius of rotation of 145 mm for 1% change in speed. Also find the effort and the power for the same speed change **05**

3A. A machine is required to punch 4 holes of 4 cm diameter in a plate of 3 cm thickness, per minute. The work required is 600 N-m/cm^2 of sheared area. The punch has a stroke of 15 cm. Maximum speed of flywheel at its radius of gyration is 35 m/s. Find the weight of flywheel if speed should not fall below 24 m/s at the radius of gyration. Also find the power of the motor. **04**

3B. Derive an expression to determine the crank effort of a single cylinder I.C. engine. **03**

3C. With neat sketch describe the turning moment diagram for a multi- cylinder engine. **03**

4A. A rear engine automobile is travelling along a track of 100 m mean radius. Each of the four wheels has a moment of inertia of 2 kg-m^2 and an effective diameter of 0.6 m. The rotating parts of the engine have a moment of inertia of 1.25 kg-m^2. The engine axis is parallel to the rear axle and the crankshaft rotates in the same direction as the wheels. The gear ratio of engine to back axle is 3:1. The automobile mass is 1500 kg and its center of gravity is 0.5 m above the road level. The width of track of the vehicle is 1.5 m. Determine the limiting speed of the vehicle around the curve for all four wheels to maintain contact with the road surface if it is not banked. **05**

4B. Sketch and explain the principle of operation of a gyro-stabilizer **03**

4C. With neat sketch explain the effects of gyroscopic couple on ship during steering and pitching **02**

5A. A shaft carries four masses A, B, C and D which are placed in parallel planes perpendicular to the longitudinal axis. The unbalanced masses at planes B and C are 3.6 kg and 2.5 kg respectively and both are assumed to be concentrated at a radius of 25 mm while the masses in planes A and D are both at radius of 40 mm. The angle between the planes B and C is 100° and that between B and A is 190°, both angles being measured in counterclockwise direction from the plane B. The planes containing A and B are 250 mm apart and those containing B and C are 500 mm. If the shaft is to be completely balanced, determine **05**
(i) Masses at the planes A and D.
(ii) The distance between the planes C and D.

5B. A twin cylinder V-engine has center lines of the cylinders at 90^0 to each other and connecting rods are connected to a common crank. Reciprocating mass of each cylinder is 16 N. Radius of the crank is 80 mm and length of the connecting rod is 40 mm. Show that the engine may be balanced for primary forces, by means of a revolving balancing mass. If the engine is running at 1900 rpm, what is the maximum value of resultant secondary force? **05**

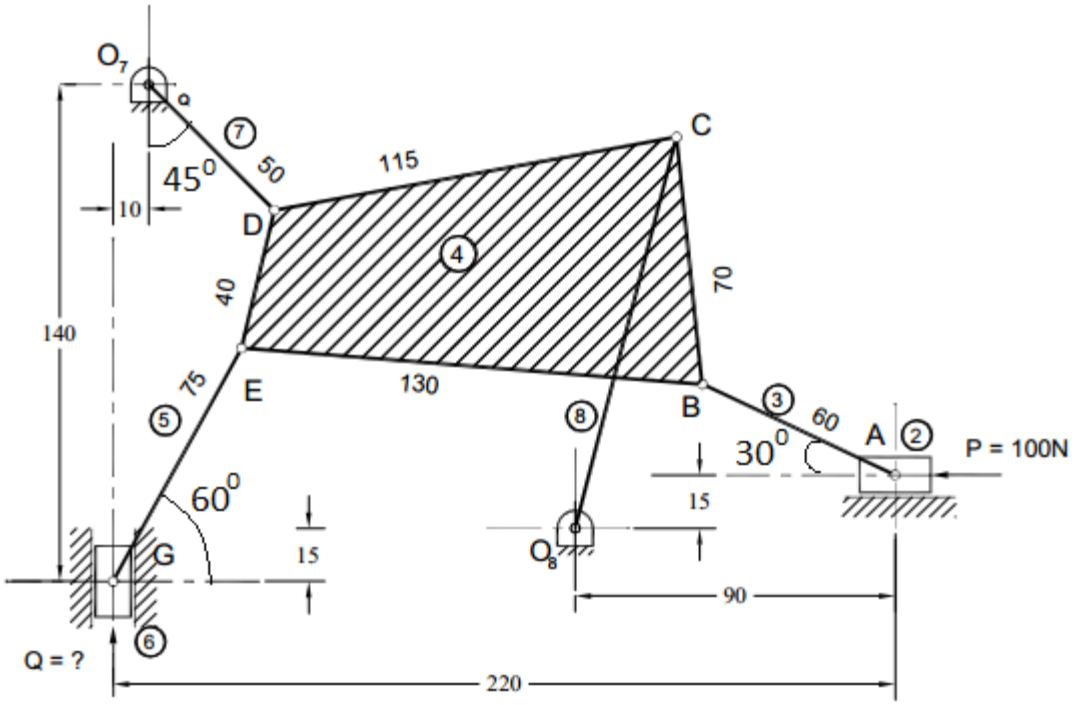

Fig. Q1A

All dimensions are in mm

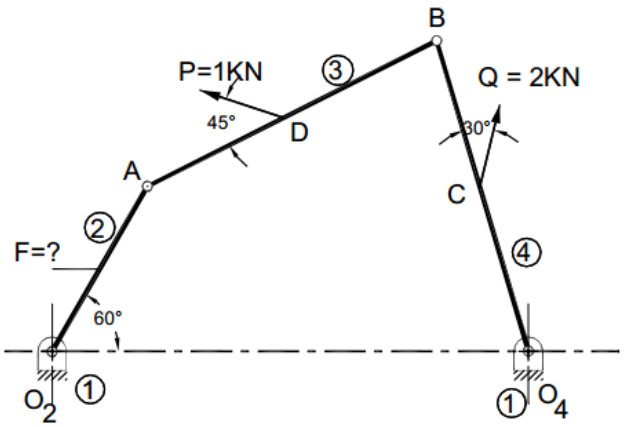

Fig. Q1B

All dimensions are in mm