Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

IV SEMESTER B.TECH. (MECHANICAL ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL/MAY 2017

SUBJECT: DYNAMICS OF MACHINERY [MME 2203]

REVISED CREDIT SYSTEM
(28/04/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. For the four bar mechanism as shown in figure 1A, determine the torque " T " to overcome a force Q = 500 N acting at point C on the connecting link ABC. BQ is vertical and angle BAC is 25°. Crank OA rotates in clockwise direction. All dimensions are in mm. (Draw the configuration, free body and analysis diagrams) **05**

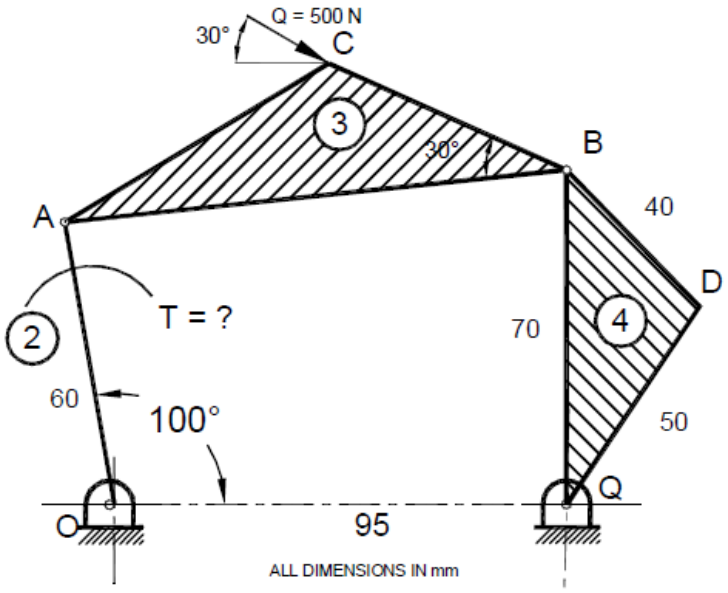

Figure. 1A

1B. Figure 1B shows a toggle press mechanism. A force of magnitude P = 500 N is applied on the slider, acting towards the left. Determine the torque developed at the crank OA. Also find the magnitude and direction of the couple " T " for maintaining static equilibrium. Point C and Q are along same line of action. (Draw the configuration, free body and analysis diagrams). All dimensions are in mm. **05**

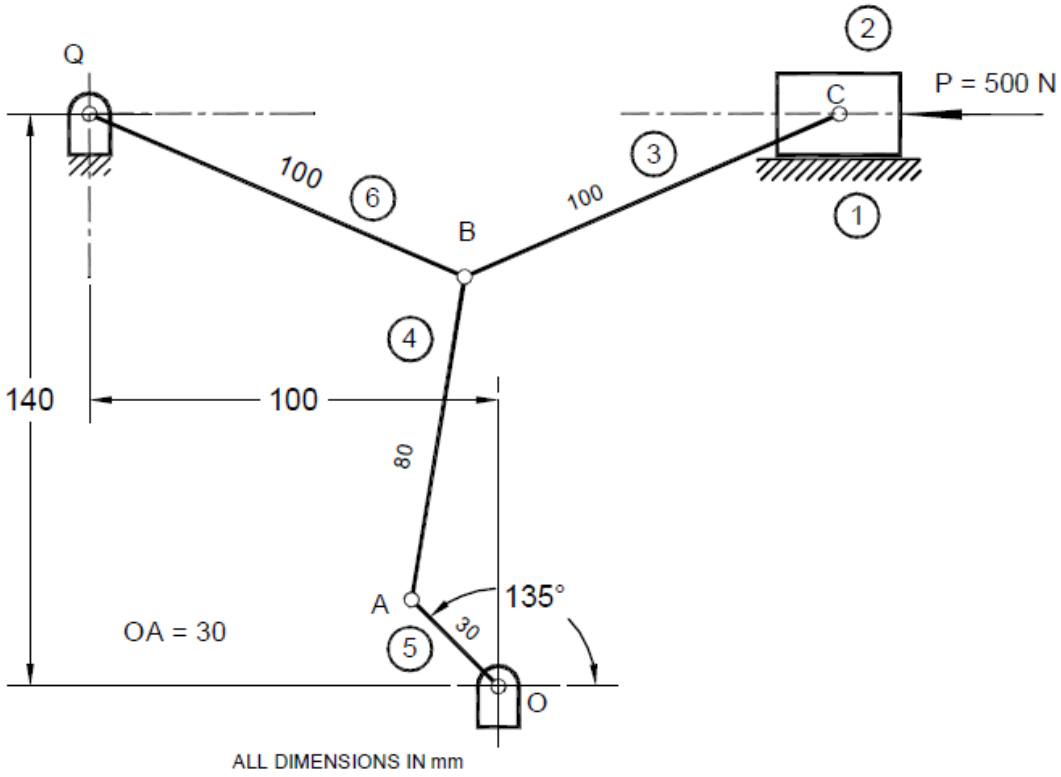

Figure. 1B

2A. Derive an expression to determine the height for a proell governor. **05**

2B. In a Hartnell governor, the extreme radii of rotation of the fly balls are 40 mm and 60 mm, and the corresponding speeds are 210 rpm and 230 rpm. The mass of fly ball is 3 kg. The lengths of the ball and the sleeve arms are equal. Determine the initial compression and the spring stiffness. **03**

2C. State and explain the significance of the following with respect to a centrifugal governor: (i). Hunting (ii). Controlling Force **02**

3A. Derive an expression (Analytical method) to determine the crank effort for a single cylinder I.C. engine. **05**

3B. The turning moment diagram for a petrol engine is drawn to the following scale. Turning moment 1mm = 5 Nm, crank angle 1mm =1°. The turning moment diagram repeats itself. The area above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm^2. The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the co-efficient of fluctuation of speed when the engine runs at 1800 rpm. **03**

3C. Explain the significance of different types of flywheels with neat sketch. **02**

4A. Explain the concept of gyrostabilizers of ships with neat sketch. **05**

4B. The propeller shaft of an aero plane has a speed of 2400 rpm. The direction of rotation is clockwise when looking from the tail end of the aero plane. The rotary engine of the aircraft has a mass of 410 kg. Determine gyroscopic couple acting on the aero plane when the aero plane travels at a speed of 240 KMPH and takes a turn to the left along a circular path of 70 m radius. Also explain the effect of gyroscopic couple on the aircraft. Take radius of gyration of the rotating parts to be = 310 mm **05**

5A. Four masses A= 200 kg, B = 300 kg, C = 240 kg and D = 260 kg are attached to a shaft. These masses are revolving at radii 270 mm, 210 mm, 300 mm and 360 mm respectively in planes measured from A at 270 mm, 420 mm and 720 mm respectively. The angles measured anticlockwise are A to B 45°, B and C 75°, C to D 135° and the distance between the planes L and M in which the balance masses are to be placed is 500 mm. The distance between planes A and L is 120 mm and M and D is 100 mm. If the balancing masses revolve at a radius of 720 mm, find their magnitude and angular positions. **05**

5B. Consider number of disturbing masses as four and explain the concept of balancing of several rotating masses by a single mass in the same plane. **03**

5C. Explain the direct and reverse crank method of balancing. **02**