Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B. TECH (IP ENGG.) END SEMESTER EXAMINATIONS, MAY 2019

SUBJECT: THEORY OF MACHINES [MME 2213]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. Explain the working of an Oldham's coupling and list the application of it **3**

1B. The Figure.1B Shows a four bar mechanism. Crank BC rotates with an angular velocity of 100 radians/sec and an angular acceleration of 4400 radians/sec^2. at the instant when the crank makes an angle of 53^0 to the horizontal. Draw the velocity and acceleration polygon and determine the linear acceleration of point E and R. **5**

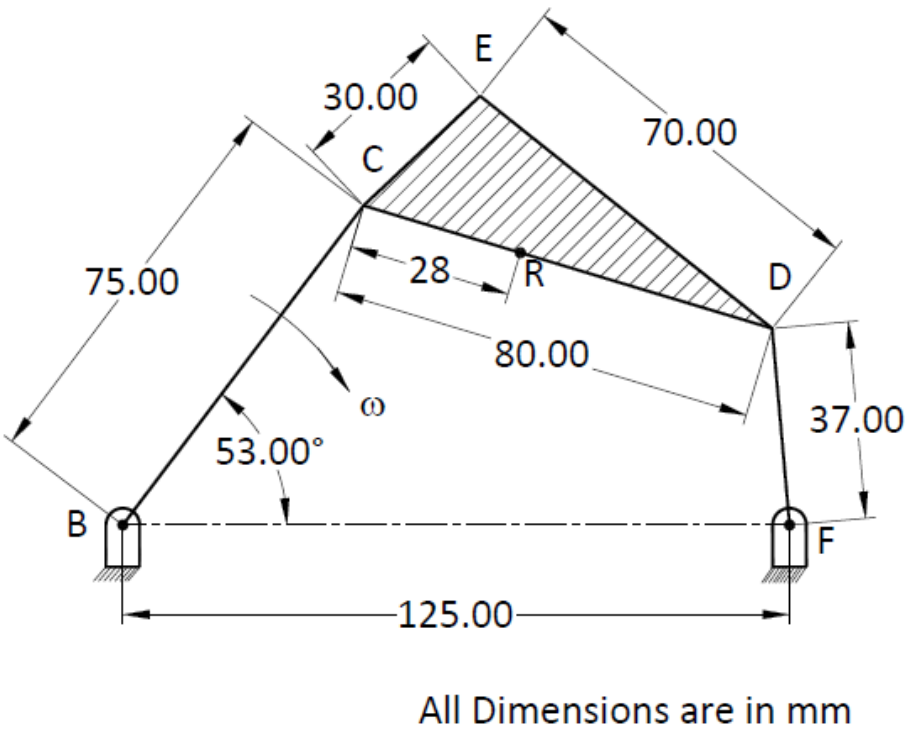

Figure. 1B

1C. Determine the mobility of the mechanisms given in Figure 1C. **2**

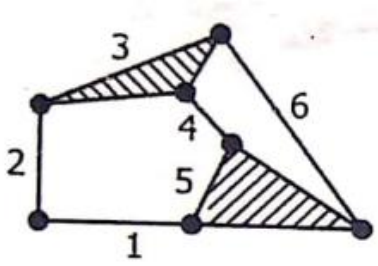

Figure 1C.

2A. State and prove Kennedy's theorem of instantaneous centre. **3**

2B. List two advantages and dis advantages of involute gear tooth profile. **2**

2C. Explain with a neat sketch Crank and Slotted Lever Quick Return Motion Mechanism and state its applications. **5**

3A. Derive an expression for minimum number of teeth required on pinion to avoid interference. **4**

3B. A pinion having 30 teeth drives a gear having 80 teeth. The gear has involute profile with 20^0 pressure angle and 10 mm addendum. If module = 12mm, Determine the length of path of contact, arc of contact and contact ratio. **3**

3C. The number of teeth on a 20^0 FDI (Full depth Involute) gear is 22 and module is 12 mm. Determine the thickness of tooth at the base circle. **3**

4A. Derive the equation of motion of a vibrating body considering it as single degree freedom spring mass damper system. **3**

4B. The Figure 4B shows an epicyclic gear train. The wheel 'E' is fixed and wheel 'C' and 'D' are integrally cast and mounted on the same pin. If arm A makes one revolution per second in counter clockwise direction, determine the speed and direction of rotation of the wheel B and F. **4**

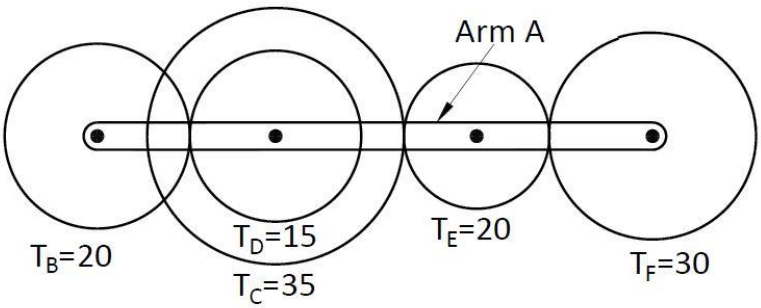

Figure 4B

4C. An open belt drive transmits 8 kW of power from a shaft rotating at 240 rpm to another shaft rotating at 160 rpm. The belt is 8 mm thick. The diameter of the smaller pulley is 600 mm and the two shafts are 5 m apart. The coefficient of friction is 0.25. If the maximum stress in the belt is limited to 3 N/mm^2, select a suitable width of the belt. **3**

5A. Determine the masses to be added at planes L and U at radii 600 mm if the system shown in Figure 5A is to be dynamically balanced. (Assume **L** palne as the reference plane) **5**

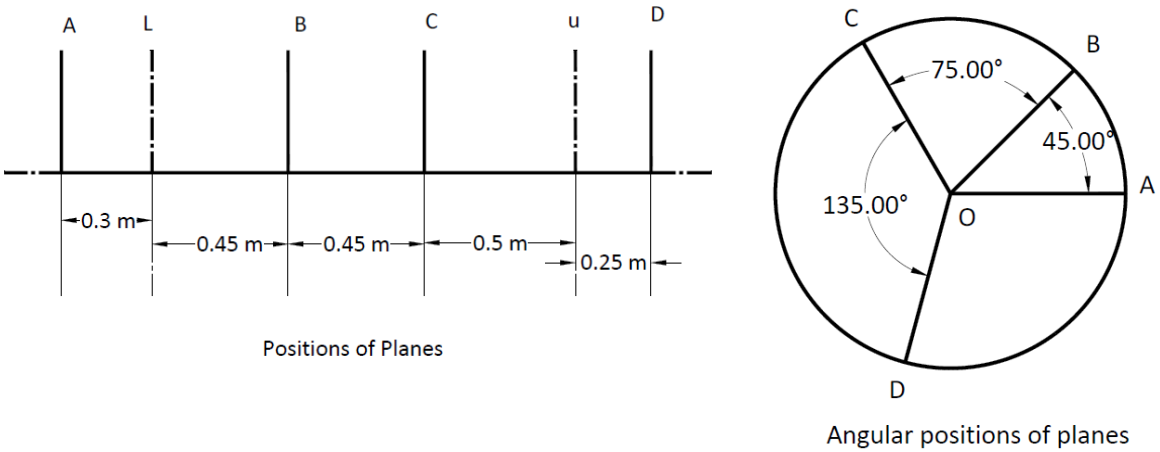

Figure 5A

Plane	Mass(kg)	Eccentricity(m)
A	400	0.22
B	600	0.18
C	480	0.25
D	520	0.30

5B. Design a cam profile for operating the exhaust valve of an oil engine. It is required to give S.H.M during opening and closing of the valve. The valve opens during the 60^0 of cam rotation. The valve must remain in the fully open position for the next 20^0 of cam rotation. Closing of the valve has to takes place during the next 60^0 cam rotation. The lift of the valve is 36 mm and the minimum radius of cam is 50 mm. The follower is provided with a roller of 40 mm diameter and its line of stroke passes through the axis of the cam. Find the maximum velocity and acceleration of the follower during opening and closing periods for a cam shaft speed of 240 rpm. **5**