Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B. TECH (I&P ENGG.)

END SEMESTER MAKE UP EXAMINATIONS, JUNE 2018

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 suitable assumed.

1A.	Sketch and explain the following i. Pendulum Pump ii. Beam Engine	**5**
1B.	The link lengths of a quadratic cycle chain are shown in figure 1B. Find all the inversions of the given chain and justify them.	**3**
1C.	Define the following terms with examples i. Mechanism ii. Structure	**2**
2A.	In the mechanism shown in figure 2A, the crank OA rotates at a uniform speed of 20 rpm in anticlockwise direction and gives motion to the sliding blocks B and D. The dimensions of various links are OA = 300 mm, AB = 1200 mm, BC = 450 mm and CD = 450 mm. For the given configuration, using relative velocity method determine: (i) Velocity of slider at B and D (ii) Angular velocity of CD.	**5**
2B.	Derive the condition for maximum power transmission by a belt drive considering the effect of centrifugal tension.	**3**
2C.	State and prove Kennedy's theorem.	**2**
3A.	Draw the profile of a cam operating a knife edge follower having lift of 40 mm. The cam raises the follower with UARM for 100° rotation followed by dwell for next 80°. The follower descends for the next 90° rotation of the cam with UARM again followed by dwell period. The cam rotates in clockwise direction and has least radius of 50 mm. Follower is offset by 15 mm towards right of the cam centre.	**6**
3B.	Derive a relation for minimum number of teeth on the gear wheel to avoid interference.	**4**

4A. A shaft carries four masses A, B, C and D placed in parallel planes perpendicular to the shaft axis and is in the same order as mentioned above along the shaft. The planes containing masses A & B is 300 mm apart, A to C is 400 mm and A to D is 600 mm. The angles between A to B is 45°, B to C is 60° and C to D is 120° the angles being measured in the anticlockwise (mass A is horizontal). The balancing masses are to be placed in planes L and M. The distance between the planes A and L is 100 mm, between L and M is 400 mm and between M and D is 100 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions by graphical method. **6**

	A	*B*	*C*	*D*
Mass (kg)	150	200	300	250
Radius (mm)	70	60	50	80

4B. Derive the relation for ratio of belt tension in a flat belt drive **4**

5A. Two 20^0 involute gears in mesh have a gear ratio of 2 and 20 teeth on the pinion. The module is 5 mm and the pitch line velocity is 1.5 m/s. Assuming addendum to be equal to one module, find (i) angle turned by the pinion and (ii) maximum velocity of sliding. **5**

5B. An epicyclic gear train as shown in figure 5B is composed of a fixed annular wheel 'A' having 150 teeth. Meshing with 'A' is a wheel 'B' which drives wheel 'D' through an idle wheel 'C', 'D' and 'A' are free to rotate about the axis. Wheels B & C are carried on an arm which revolves clockwise at 100 rpm about the axis of A or D. if the wheels B and D are having 25 teeth and 40 teeth respectively, find the number of teeth and speed of idle wheel 'C' by tabular method. **5**

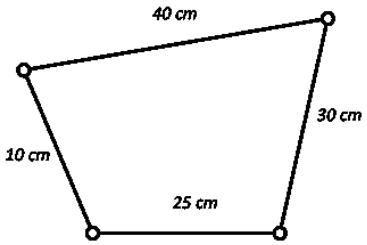

Figure 1B

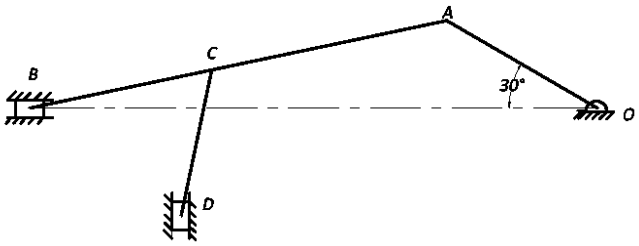

Figure 2A

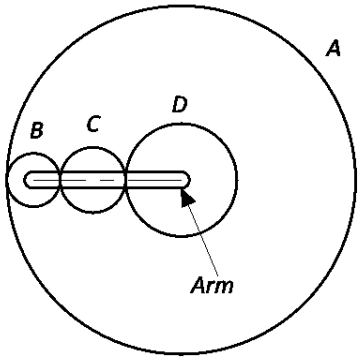

Figure 5B