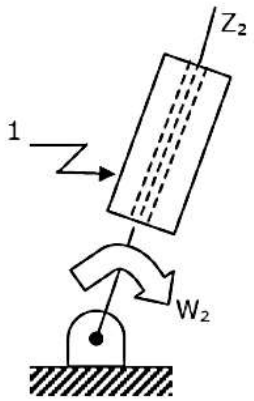
Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

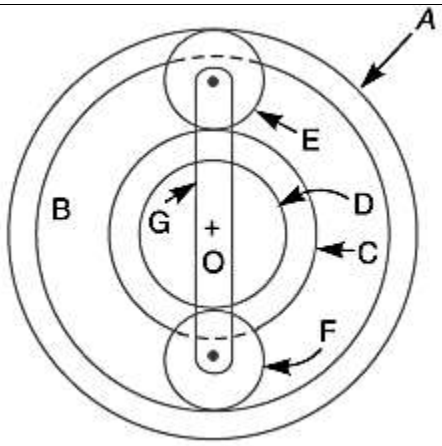
End Semester Examination, May 2019

Programme Name: B Tech. ADE **Semester : IV**
Course Name : Kinematics & Dynamics of Machines **Time : 03 hrs**
Course Code : ADEG-224 **Max. Marks : 100**
Nos. of page(s) : 3
Instructions:

SECTION A

S.N		Marks	CO
1	A standard gear has outside diameter as 96 mm and module 3 mm calculate number of teeth on gear and circular pitch.	5	CO
2	Discuss the three types of instantaneous centres for a mechanism.	5	CO1
3	Explain the terms 'static balancing' and 'dynamic balancing'	5	CO5
4	In the figure shown below, the relative velocity of link 1 with respect to link 2 is 12 m/sec. Link 2 rotates at constant speed of 120 rpm. Calculate the magnitude of coriolis component of acceleration. 	5	CO1

5	Explain Grubler's criterion applicable for planar mechanism and differentiate between redundant link and redundant degree of freedom with example.	**10**	**CO1**
6	Draw the gear tooth profile and show the below mentioned terminologies on it. 1. Addendum 2. Circular Pitch 3. Dedendum 4. Face of tooth 5. Flank of tooth. Also explain the importance of backlash and module in gears.	**10**	**CO3**
7	From the following data, draw the displacement diagram for the follower in which it moves with simple harmonic motion during ascent while it moves with uniformly accelerated motion during descent: Least radius of cam = 50 mm; Angle of ascent = 48°; Angle of dwell between ascent and descent = 42° ; Angle of descent = 60° ; Lift of follower = 40 mm ; If the cam rotates at 360 r.p.m. anticlockwise, find the maximum velocity and acceleration of the follower during descent.	**10**	**CO2**
8	The turbine rotor of a ship has a mass of 8 tonnes and a radius of gyration 0.6 m. It rotates at 1800 r.p.m. clockwise, when looking from the stern. Determine the gyroscopic couple, if the ship travels at 100 km/hr and steer to the left in a curve of 75 m radius.	**10**	**CO5**
	OR		
9	Explain the effect of the gyroscopic couple on the reaction of the four wheels of a vehicle negotiating a curve.	**10**	**CO5**
10	In an epicyclic gear train as shown in figure below, the internal wheels A and B and compound wheels C and D rotate independently about axis O. The wheels E and F rotate on pins fixed to the arm G. E gears with A and C and F gears with B and D. All the wheels have the same module and the number of teeth are : TC = 28; TD = 26; TE = TF = 18.	**20**	**CO3**

	 Find the number of teeth on 1. A and B 2. If the arm G makes 100 r.p.m. clockwise and A is fixed, find the speed of B 3. If the arm G makes 100 r.p.m. clockwise and wheel A makes 10 r.p.m. counter clockwise ; find the speed of wheel B.		
11	Four masses A, B, C and D as shown below are to be completely balanced. **A** / **B** / **C** / **D** **Mass (kg)**: **—** / **30** / **50** / **40** **Radius (mm)**: **180** / **240** / **120** / **150** The planes containing masses B and C are 300 mm apart. The angle between planes containing B and C is 90°. B and C make angles of 210° and 120° respectively with D in the same sense. Find : **1.** The magnitude and the angular position of mass A **2.** The position of planes A and D.	**20**	**CO4**
	OR		
12	A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X	**20**	**CO4**

	and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions.		