U.S.N.										

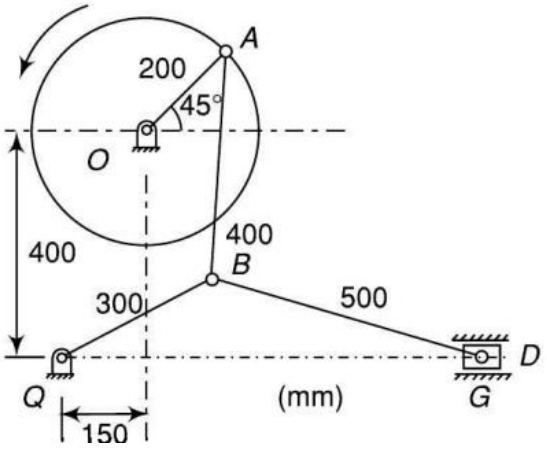
B.M.S. College of Engineering, Bengaluru-560019

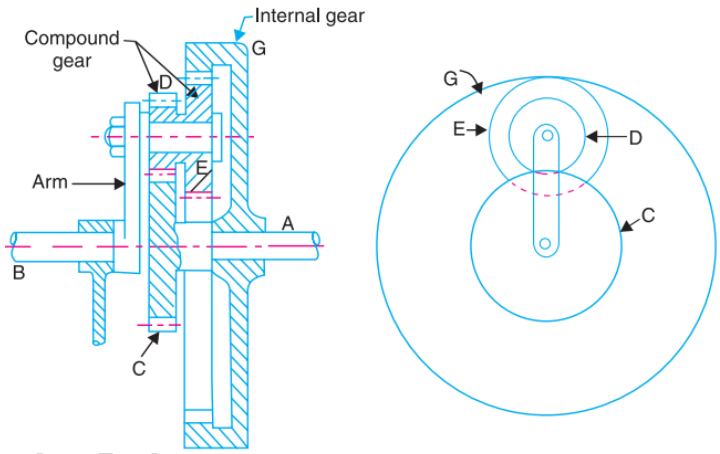
Autonomous Institute Affiliated to VTU

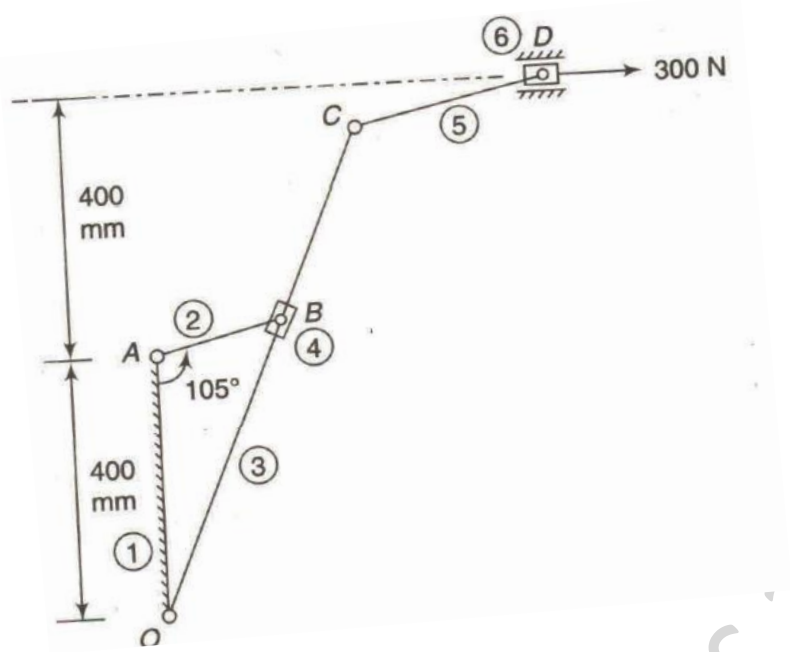
October 2024 Supplementary Examinations

Programme: B.E. **Semester: IV**
Branch: Mechanical Engineering **Duration: 3 hrs.**
Course Code: 23ME4PCTOM **Max Marks: 100**
Course: Theory of Machines

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

		UNIT - I	CO	PO	Marks
1	a)	Identify a mechanism in a common machine and describe the kinematic pairs within it.	CO1	PO1	**06**
	b)	Explain the concept of inversion in a mechanism. Describe briefly the function of elliptical trammel and oldham's coupling.	CO1	PO1	**14**
		UNIT - II			
2		In the toggle mechanism as shown in the Fig. 1, the crack OA rotates at 210 rpm counter clockwise increasing at the rate of 60 rad/s^2. For the given configuration, determine: i) velocity of slider D and angular velocity of link BD ii) acceleration of slider D and angular acceleration of link BD  Fig.1	CO2	PO2	**20**
		OR			
3	a)	What is Coriolis component of the acceleration? Obtain the expression for the same.	CO3	PO1	**08**
	b)	The crank and connecting rod of a reciprocating engine are 200 mm and 700 mm respectively. The crank is rotating in clockwise direction at 120 rad/s. Find with the help of Klein's construction: i) velocity and acceleration of the piston,	CO2	PO2	**12**

			ii) velocity and acceleration of the midpoint of the connecting rod, and iii) angular velocity and angular acceleration of the connecting rod, at the instant when the crank is at 30° to I.D.C. (inner dead centre).			
			UNIT - III			
	4	a)	Each of two gears in a mesh has 48 teeth and a module of 8mm. The teeth are of 20^0 involute profile. The arc of contact is 2.25 times the circular pitch. Determine the addendum.	*CO2*	*PO2*	**06**
		b)	Two shafts A and B are co-axial (Fig.2). A gear C (50 teeth) is rigidly mounted on shaft A. A compound gear D-E gears with C and an internal gear G. D has 20 teeth and gears with C and E has 35 teeth and gears with an internal gear G. The gear G is fixed and is concentric with the shaft axis. The compound gear D-E is mounted on a pin which projects from an arm keyed to the shaft B. Find the number of teeth on internal gear G assuming that all gears have the same module. If the shaft A rotates at 110 r.p.m., find the speed of shaft B.  Fig.2	*CO2*	*PO2*	**14**
			UNIT - IV			
	5	a)	What are turning-moment diagrams? Draw turning-moment diagrams for (i) Single- Cylinder Double acting Steam engine (ii) Single-Cylinder 4-Stroke Internal Combustion Engine	*CO2*	*PO2*	**06**
		b)	For the static equilibrium of the quick return mechanism shown in Fig.3, determine the input torque T2 to be applied on link AB for a force of 300N on the slider D. The dimensions of the various links are OA=400mm, AB=200mm, OC=800mm, CD=300mm.	*CO2*	*PO2*	**14**

			 Fig. 3			
			UNIT - V			
	6	a)	Explain "Dynamic Balance" as applied to revolving masses in the different planes, and how to achieve it.	*CO2*	*PO1*	**04**
		b)	A, B, C and D are four masses carried by a rotating shaft at radii 100,125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance.	*CO2*	*PO2*	**16**
			OR			
	7		In an in-line six-cylinder engine working on two stroke cycle, the cylinder centre lines are spaced at 600 mm. In the end view, the cranks are 60° apart and in the order 1-4-5-2-3-6. The stroke of each piston is 400 mm and the connecting rod length is 1 metre. The mass of the reciprocating parts is 200 kg per cylinder and that of rotating parts 100 kg per crank. The engine rotates at 300r.p.m. Examine the engine for the balance of primary and secondary forces and couples. Find the maximum unbalanced forces and couples.	*CO2*	*PO2*	**20**

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