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

Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Aerospace Engineering **Duration: 3 hrs.**
Course Code: 20AE5DCMAM **Max Marks: 100**
Course: Machines and Mechanisms

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

1 a) Explain with neat diagrams, various inversions of the slider crank chain. **12**

b) Explain the working and the applications of Geneva mechanism. **8**

UNIT - II

2 a) An engine crankshaft drives a reciprocating pump through a mechanism as shown here Fig. 2a. The crank rotates in the clockwise direction at 160 rpm. The diameter of the pump piston at F is 200 mm. Dimensions of the various links are OA=170mm, CD=170mm, AB=660mm, DE=830mm, BC=510mm. For the position of the crank, OA shown in the diagram, determine the velocity of the crosshead, E, the velocity of rubbing at the pins A, B, C and D, the diameters being 40, 30, 30 and 50 mm respectively. **12**

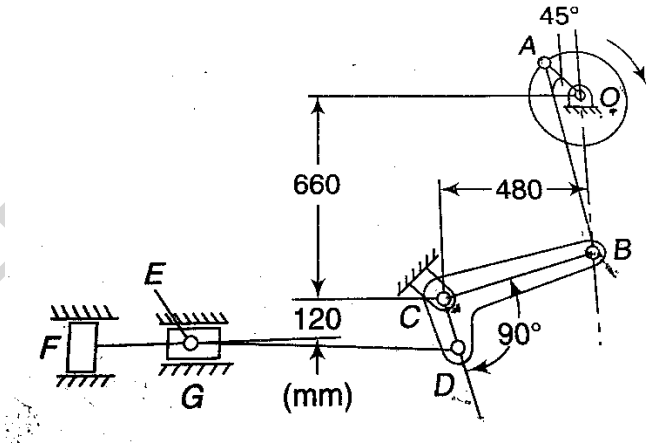

Fig. 2a

b) With neat sketch explain and locate the instantaneous centers in various types of joints. **8**

UNIT - III

3 a) Derive the expression for the Coriolis acceleration of a moving point relative to a fixed body. **8**

b) In a slider crank mechanism, the lengths of the crank and the connecting rod are 200 mm and 800 mm respectively. For the position of the crank when it has turned 30^o from the inner dead centre. Also find the velocity of the slider and the angular velocity of the connecting rod if the crank rotates at 40 rad/s and angular acceleration of 10 rad/s^2 both in counter clockwise direction. **12**

OR

4 a) In the mechanism shown here in Fig. 4a, the crank OA rotates at 60 rpm. Determine the linear acceleration of the slider at B and the angular acceleration of the links AC, CQD and BD. **20**

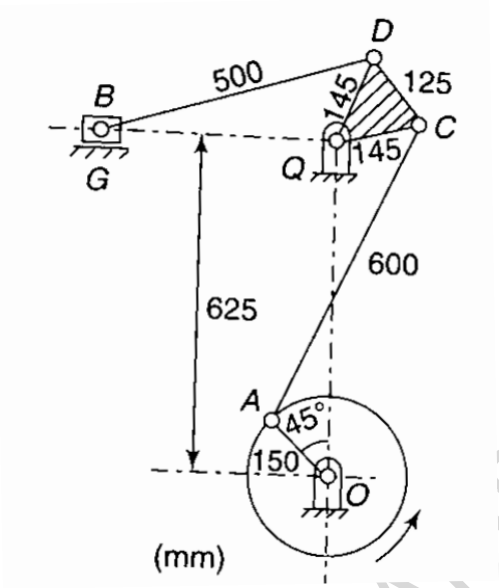

Fig. 4a

UNIT - IV

5 a) In a reduction gear shown here in Fig. 5a, the input S has 24 teeth, P and C constitute a compound planet having 30 and 18 teeth respectively. If all the gears are of the same pitch, find the ratio of the reduction gear. Assume A to be fixed. **12**

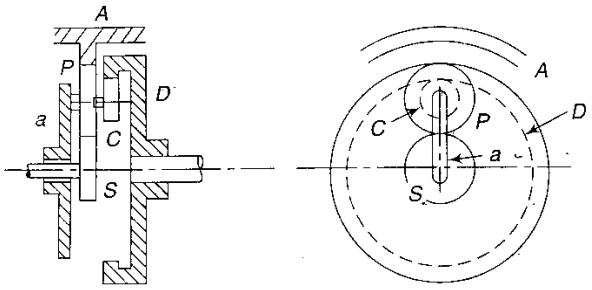

Fig. 5a

b) Explain the effect of gyroscopic couple on a rigid disc fixed centrally to the rotating shaft. Discuss gyroscopic couple and mass of disc effect on shaft bearings. **8**

UNIT - V

6 a) Explain with neat sketch for static force analysis in a slider crank mechanism with considering rolling friction and sliding friction under gas force on the slider. **8**

b) A four-bar mechanism shown in Fig. 6b, with the following dimensions is acted upon by a force 80 N at an angle of 150° on the link DC. AD = 500 mm, AB =400 mm, BC = 1000 mm, DC = 750 mm and DE =350 mm. Determine the input torque T on the link AB for the static equilibrium of the mechanism for the given configuration. **12**

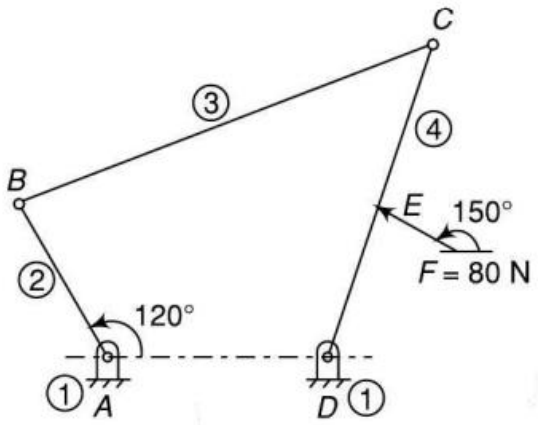

Fig.6b

OR

7	a)	Derive the expression for resultant inertia force and its location applied to the link in reference to center of gravity.	**8**
	b)	Explain the procedure to perform dynamic force analysis in slider crack chain machinery with neat sketches under consideration of inertia forces of the links.	**12**

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