

MECHANICS OF MACHINERY

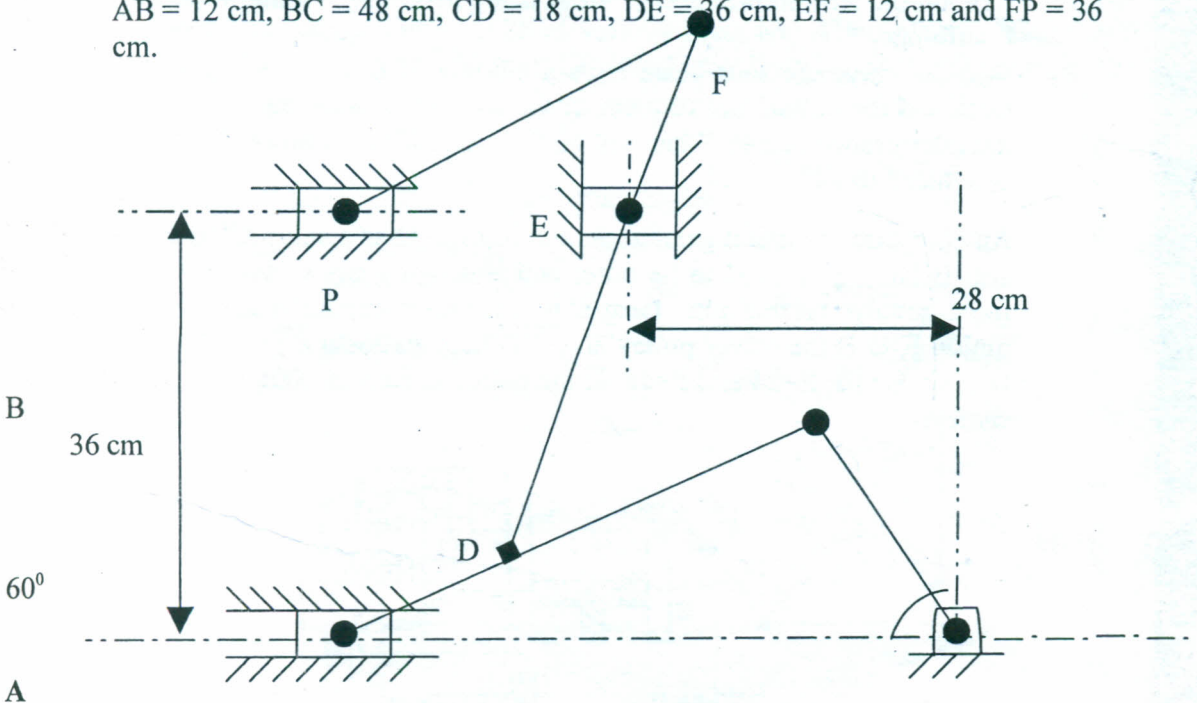
(NR-Aeronautical Engineering)

Time: 3 hours

Max. Marks: 80

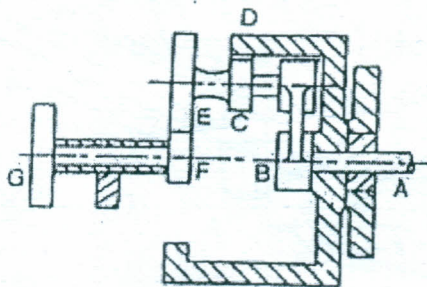
Answer any FIVE questions
All questions carry equal marks

- How is the mechanism of higher pair can be replaced by the mechanism of lower pair?
 - Write notes on complete and incomplete constraints in lower and higher pairs, illustrating your answer with neat sketches.
- What do you mean by a Pantograph? With a neat sketch explain the principal and working of the pantograph. What are its uses?
- In the steam engine mechanism shown in figure, the crank AB rotates at 200 r.p.m. Find the velocities and accelerations of C, D, E, F and P. The dimensions of various links are:
AB = 12 cm, BC = 48 cm, CD = 18 cm, DE = 36 cm, EF = 12 cm and FP = 36 cm.



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4. a) How the velocity of a point on a link is determined by instantaneous centre method.
- b) The crank OA of a steam engine is 8 cm and the length of the connecting rod AB is 24 cm. The centre of gravity of the rod is at G, 8 cm from the crank pin. The engine speed is 600 rad/min. For the position when the crank makes 45° to the horizontal measured from the inner dead centre, find the velocity and acceleration of the piston. Also find the acceleration of the centre of gravity of the connecting rod.
5. a) What is the function of a steering gear. What are the mechanisms used in general. Explain any one of them.
- b) In a Davis Steering gear the distance between the pivot's of the front axle is 1 metre and the wheel base is 2.5 metres. Find the inclination of the track arm to the longitudinal axis of the car, when it is moving along a straight path.
6. Design a cam for operating the exhaust valve of an oil engine. It is required to give S.H.M during opening and closing of the valve each of which corresponds to 60 of cam rotation. The valve must remain in fully open position for 20 of cam rotation. The lift of the valve is 36m.m and the least radius of the cam is 50 m.m. The follower is provided with a roller of 40 m.m 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 R.P.M.
7. a) Explain the term interference. What is the necessary condition for no interference?
- b) Two 20° involute spur gears have a module of 6 mm. The larger wheel has 36 teeth and the pinion has 16 teeth. If the addendum were equal to one module, will the interference occur? What will be the effect if the number of teeth on the pinion is reduced to 14?
8. An epicyclic reduction gear, as shown in Fig. 9 has a shaft A fixed to arm B. The arm B has a pin fixed to its outer end and two gears C and E which are rigidly fixed, revolve on this pin. Gear C meshes with annualr wheel D and gear E with pinion F, G is the driver pulley and D is kept stationary. The number of teeth are: D = 80; C=10; E=24 and F=18. If the pulley G runs at 200 r.p.m. find the speed of shaft A



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