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B. E. (Fourth Semester) Examination, Nov.-Dec. 2021

(New Scheme)

(Mech., Production and Automobile Branch)

KINEMATICS of MACHINES

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

*Note : Solve all the **five** questions. Attempt each question worth 16 marks.*

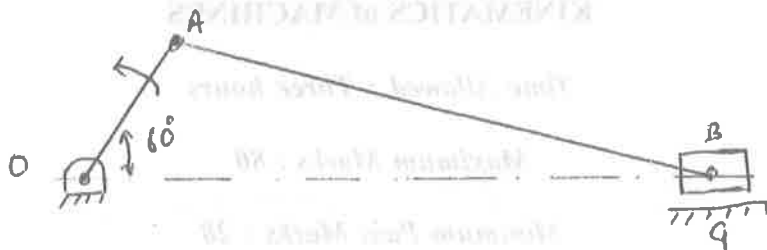### Unit-I

1. (a) What is Kinematic Link?   2

   (b) Explain Whitworth Quick-Return Mechanism.   7

(c) In a slider-crank mechanism, the crank is 480 mm long and rotates at 20 rad/s in the counter-clockwise direction. The length of the connecting rod is 1·6 m. When the crank turns 60°C from the inner-dead centre. Determine the :

(i) Velocity of the slider.

(ii) Angular velocity of the connecting rod.

(iii) Velocity of rubbing at the pin of crank having diameter 60 mm.　　　　　　7

Unit-II

2. (a) What is Lower Pairs?　　　　　2

(b) Explain Klein's construction.　　　7

(c) Explain Toggle Mechanism.　　　7

(d) One cylinder of a rotary engine is shown in fig. OA is fixed crank, 200 mm long, OP is the connecting rod and is 520 mm long. The line of stroke is along AR and at the instant is inclined at 30° to the vertical. The body of the engine consisting of cylinders rotates at a uniform speed of 400 rpm about the fixed centre A. Determine the acceleration of piston (slider).　　　7
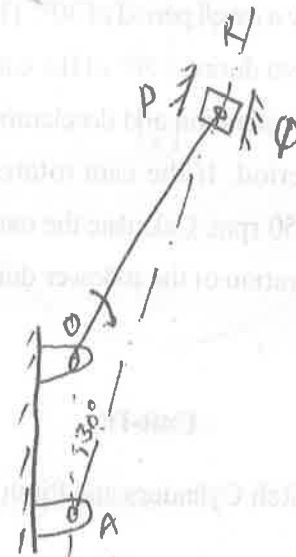
Unit-III

3. (a) Define cam and follower.   2

   (b) Draw the profile of a cam operating a roller reciprocating follower and with the following data :

   Maximum lift = 30 mm

   Minimum radius of cam = 25 mm

   Roller diameter = 15 mm

   The cam lifts the follower for 120° with SHM followed by a dwell period of 30°. Then the follower lowers down during 150° of the cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at a uniform speed of 150 rpm. Calculate the maximum velocity and acceleration of the follower during the descent period.   14
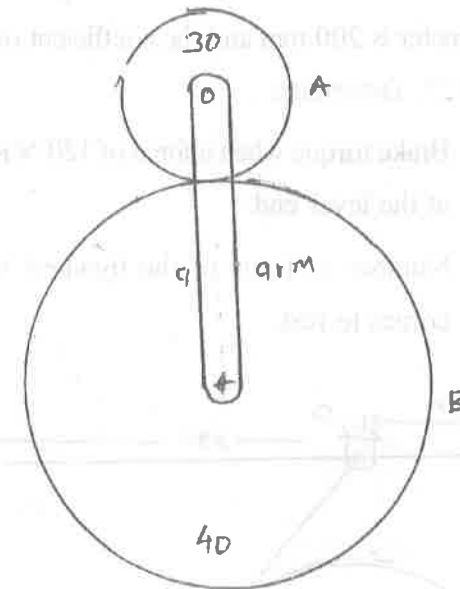
Unit-IV

4. (a) Explain Pitch Cylinders and Pitch Circle.   2

   (b) Explain "Law of Gearing".   7

(c) An epicyclic gear train consists of an arm and two gear A and B having 30 and 40 teeth respectively. The arm rotates about the centre of the gear A at a speed of 80 rpm counter clockwise. Determine the speed of gear B if the gear A is fixed.   7

Unit-V

5. (a) What is Dynamometer?   2

   (b) Explain Epicyclic-Train Dynamometer.   7

(c) Explain "Uniform Pressure and Uniform Wear" theories in Bearing. 7

(d) The simple band brake is applied to a shaft carrying a flywheel of 250 kg mass and of radius of gyration of 300 mm. The shaft speed is 200 rpm. The drum diameter is 200 mm and the coefficient of friction is 0·25. Determine :

(i) Brake torque when a force of 120 N is applied at the lever end.

(ii) Number of turns of the flywheel before it comes to rest. 7