

[Total No. of Question: 09]
Univ. Roll No.....

[Total No. of Pages: 2]

Program: B.Tech. (Batch 2018 onward)
Semester: 4th
Name of subject: Theory of Machines
Subject Code: PCME-106
Paper ID: 16195

Time Allowed: 3 Hours

Max. Marks: 60

NOTE:

- 1) Parts A and B are compulsory
- 2) Part C has Two questions Q8 and Q9. Both are compulsory, but with internal choice.
- 3) Any missing data may be assumed appropriately

Part – A

[Marks: 02 each]

Q1.

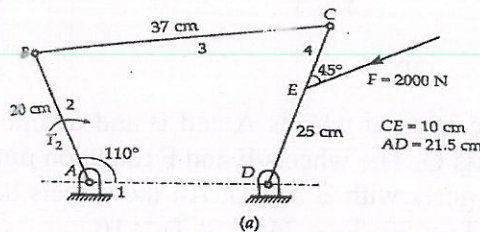
- a) State D' Alembert's principle.
- b) Why double helical gears are preferred over single helical gears?
- c) What is the use of Oldham coupling?
- d) Differentiate between cam angle and pressure angle.
- e) What is swaying couple explain its effects?
- f) Why crowning of pulley is required?

Part-B

[Marks: 04 each]

- Q2. Two involute gears of 20° pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2. If the pitch expressed in module is 5 mm and the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module, find:
1. The angle turned through by pinion when one pair of teeth is in mesh
 2. The maximum velocity of sliding.

- Q3. Find torque T_2 , neglect friction.



- Q4. Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and pulley is 0.25 ?

- Q5. 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.
- Q6. Explain various types of brakes with their applications.
- Q7. Derive an expression for the balancing of V-engines.

Part- C

[Marks: 12 each]

- Q8. It is required to set out the profile of a cam to give the following motion to the reciprocating follower with a flat mushroom contact face:
- Follower to have a stroke of 20 mm during 120° of cam rotation;
 - Follower to dwell for 30° of cam rotation;
 - Follower to return to its initial position during 120° of cam rotation; and
 - Follower to dwell for remaining 90° of cam rotation.

The minimum radius of the cam is 25 mm. The out stroke of the follower is performed with simple harmonic motion and the return stroke with equal uniform acceleration and retardation.

OR

Describe any three inversions of single slider crank chain with neat sketches.

- Q9. Find out the acceleration of the slider D and the angular acceleration of link CD for the engine mechanism shown in Fig. 1 the crank OA rotated uniformly at 180 r.p.m. in clockwise direction. The various lengths are: OA = 150 mm, AB = 450 mm; PB = 240 mm; BC = 210 mm; CD = 660 mm.

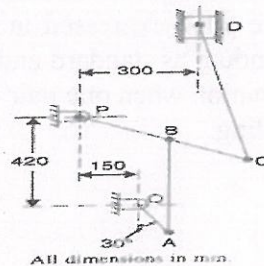


Fig 1.

OR

In an epicyclic gear train, 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 : $T_C = 30$; $T_D = 24$; $T_E = T_F = 16$.

- Sketch the arrangement;
- Find the number of teeth on A and B
- If the arm G makes 100 r.p.m. clockwise and A is fixed, find the speed of B
- 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.

23 JUN 2022

- Q5. 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.
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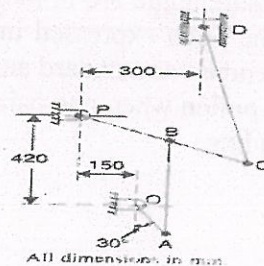


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Part – A

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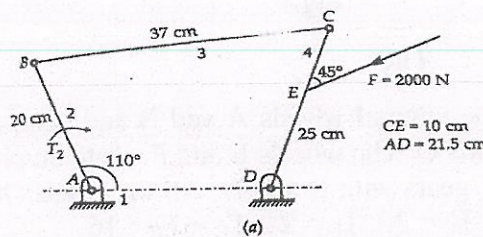
Part- B

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