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Total No. of Questions : 09

Total No. of Pages : 02

B.Tech.(ME) (Sem.–4)
THEORY OF MACHINES – II
Subject Code : BTME-402
M.Code : 59130
Date of Examination : 05-01-23

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :
1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION–A

1. Write briefly :

   a. What is free body diagram?

   b. What is dynamically equivalent system?

   c. Classify gears based on the position of teeth on wheel.

   d. *'Reciprocating masses cannot be balanced completely'.* Why?

   e. Give **two** applications of worm gears.

   f. State D Alembert's principle.

   g. State fundamental law of gearing.

   h. Describe the condition of balancing in multicylinder inline V-Engines.

   i. Write down the freudenstien equation in reference to kinematic synthesis.

   j. What do you mean by hammer below?

SECTION-B

2. How is the friction effect taken into account at the turning and sliding pairs of a mechanism? Explain in detail.

3. Four masses m_1, m_2, m_3 and m_4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45°, 75°, and 135°. Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m.

4. Explain, how are the gear train classified? Give atleast one distinguished feature of each type.

5. A pinion of 20 involute teeth and 125 mm pitch circle diameter drives a rack. The addendum of both pinion and rack is 6.25 mm. What is the least pressure angle which can be used to avoid interference? With this pressure angle, find the length of the arc of contact and the minimum number of teeth in contact at a time.

6. Prove that the resultant unbalanced force is minimum when half of the reciprocating masses are balanced by rotating masses

SECTION-C

7. In a epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 300 r.p.m in the clockwise direction, what will be the speed of gear B?

8. A pair of locomotive driving wheels with the axle, have a moment of inertia of 180kg-m². The diameter of the wheel treads is 1.8m and the distance between wheel centers is 1.5 m. When the locomotive is travelling on a level track at 95 km/h, defective ballasting causes one wheel to fall 6mm and to rise again in a total time of 0.1s. If the displacement of the wheel takes place with simple harmonic motion, find: (a) the gyroscopic couple set up and (b) the reaction between the wheel and the rail due to this couple.

9. Explain the following:

   a) Two and Three point synthesis.

   b) Simple and Compound gear trains.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.