15AE44

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Mechanisms and Machine Theory

Time: 3 hrs.

Max. Marks: 80

Note: *Answer FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain the three inversions of four bar chain mechanism. **(09 Marks)**
  b. Explain with a neat sketch, Elliptical trammel and Oldhaum's coupling. **(07 Marks)**

OR

2 a. Explain Peaucellier mechanism, Geneva mechanism and Toggle mechanism with a neat sketch. **(10 Marks)**
  b. Give the condition for correct steering in motor car. **(06 Marks)**

Module-2

3 The Fig.Q3 shows a quick return mechanism. Link 2 rotates uniformly at 20 rad/sec, in clockwise direction. Determine the angular acceleration of link 3.
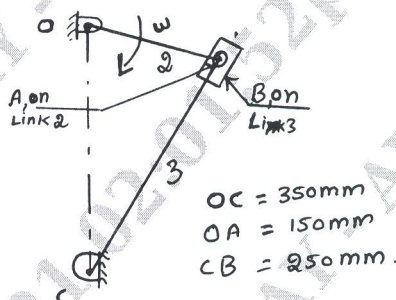

OC = 350mm
OA = 150mm
CB = 250mm.

Fig.Q3 **(16 Marks)**

OR

4 A four bar mechanism under the action of two external forces is shown in Fig.Q4. Determine the torque to be applied on the link AB for static equilibrium. The dimensions of the links are AB = 50mm, BC = 66mm, CD = 55mm, CF = 30mm, BAD = 60° and AD = 100mm.
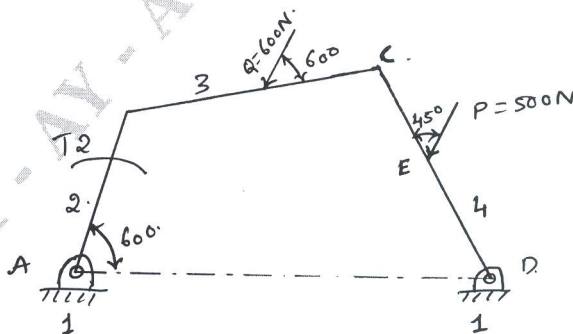

Fig.Q4 **(16 Marks)**

Module-3

5 a. Explain Law of Gearing with a neat sketch. **(06 Marks)**

   b. Derive an expression to find the minimum number of teeth on a gear to avoid interference and minimum number of teeth on a pinion to avoid interference. **(10 Marks)**

OR

6 With a neat sketches explain the following :

   a. Simple gear train

   b. Compound gear train

   d. Reverted gear train

   c. Epicyclic gear train. **(16 Marks)**

Module-4

7 a. What is balancing and explain static and dynamic balancing. **(06 Marks)**

   b. A 3.6m long shaft carries 3 pulleys, two at its two ends and the 3rd pulley at the midpoint. The two end pulleys have masses 79 and 40kg respectively and their C.G are 3mm and 5mm from the axis of shaft respectively. The middle pulley has a mass of 50kg and its C.G is 8mm. The pulleys are 50 keyed to the shaft that the assembly is in static balance. The shaft rotates at 300rpm in 2 bearings, 2.4m apart with equal overhangs on either side determine. Relative angular positions of the pulleys. **(10Marks)**

OR

8 In a 3 cylinder radial engine all the connecting rods acts on a single crank. The cylinder centre lines are set at 120°. Mass of reciprocating parts per cylinder = 2.5kg.
   (rank length = 0.075m, connecting rod length = 0.275m and speed = 1800rpm. Determine :

   i) Maximum unbalanced primary force and the balancing mass to be attached at 100mm radius to give primary balance.

   ii) Maximum unbalanced secondary force and the balancing mass to be attached at 100mm radius to give secondary balance. **(16 Marks)**

Module-5

9 a. Explain controlling force diagram for Hartnell governor or condition for stability of spring controlled governor and also compare Flywheel and Governor. **(08 Marks)**

   b. Each arm of a porter governor is 300mm long and is pivoted on the axis of the governor. Each ball has a mass of 6kg and the mass of sleeve is 18kg. The radius of rotation of a ball is 200mm when the governor beings to lift and 250mm when the speed is maximum. Determine the maximum and minimum speed and the range of speed of governor. **(08 Marks)**

OR

10 a. Describe the effect of gyroscopic couple on an Aeroplane. **(10 Marks)**

   b. An aeroplane makes a complete half circle of 50m radius towards left when flying at 200km/hr. The mass of the rotary engine and the propeller is 400 kg with radius of gyration 300mm. The engine runsat 3000rpm counter clockwise when viewed from the rear. Determine the gyroscopic couple and its effect on the air craft. **(06 Marks)**

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