CBCS SCHEME

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17AU43

Fourth Semester B.E. Degree Examination, June/July 2024
Kinematics of Machines

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define : (i) Link (ii) Kinematic pairs (iii) Kinematic chain (iv) Mechanism (v) Inversions **(10 Marks)**

b. Sketch and explain crank and slotted lever quick return motion mechanisms. **(10 Marks)**

OR

2 a. Sketch and explain the working of (i) Pantograph (ii) Ratchet and Pawl mechanism. **(10 Marks)**

b. Sketch and explain Ackermann Steering Gear Mechanism. **(10 Marks)**

Module-2

3 a. In a Slider crank mechanism, the crank OB = 30mm and the connecting rod BC = 120mm. The crank rotates at a uniform speed of 300RPM clockwise. For the crank position shown in Fig.Q.3(a), find

i) Velocity of piston 'C' and angular velocity of connecting rod 'BC'

ii) Acceleration of piston 'C' and angular acceleration of connecting rod 'BC'.

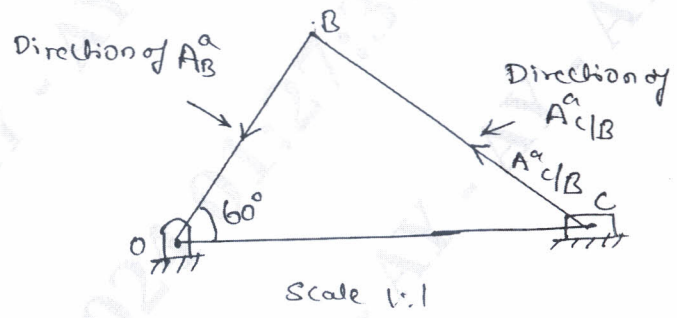

Fig.Q.3(a) **(12 Marks)**

b. Illustrate Arnold – Kennedy theorem. **(08 Marks)**

OR

4 a. In a slider crank mechanism shown in Fig.Q.4(a). The crank OA = 300mm and connecting rod AB = 1200mm. The crank OA is turned 30° from inner dead centre. Locate all the instantaneous centers. If the crank rotates as 15 rad/sec clockwise, find : i) Velocity of slider B and ii) Angular velocity of connecting rod AB.

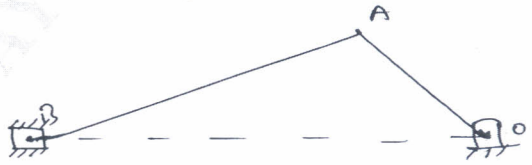

Fig.Q.4(a) **(12 Marks)**

b. An epicyclic gear train as shown in Fig.Q.7(b). The wheel 'A' is fixed and the input at the arm 'R' is 3 kW at 600 rpm. Find the speed of wheel 'D' and the torque on it and the torque required to hold the wheel 'A'. Neglect frictional losses.

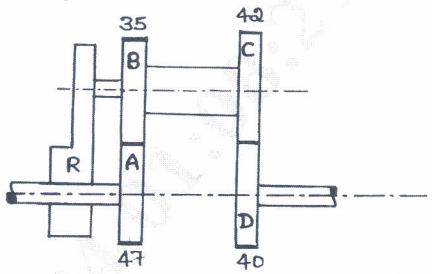

Fig.Q.7(b)

(10 Marks)

OR

8 a. Two gear wheel mesh externally and are to give a velocity ratio of 3. The teeth are of involute form of a module 6mm and standard addendum one module. Pressure angle = 18°. Pinion rotates at 90 rpm. Find (i) Number of teeth on each wheel so that interference is just avoided (ii) Length of path of contact (iii) length of arc of contact (iv) Maximum velocity of sliding between teeth (v) Number of pairs of teeth in contact. **(12 Marks)**

b. Sketch and explain the gear trains used in (i) Watches (ii) Automobile gear box. **(08 Marks)**

Module-5

9 A cam rotating clockwise at uniform speed of 300rpm operates a reciprocating follower through of a roller radius 1.5cm diameter. The follower motion is as defined below :

i) Outward during 150° with UARM.
ii) Dwell for next 30°
iii) Return during next 120° with SHM
iv) Dwell for the remaining period

Stroke of follower is 3cm. minimum radius of the cam is 3cm. Draw the cam profile if the follower axis is offset by 1cm to the right of cam axis. **(20 Marks)**

OR

10 The exhaust valve of a diesel engine has a lift of 62.8mm. It is operated by a cam to give cycloidal motion during and closing periods each of which corresponds to 120° of cam rotation. The follower is provided with a roller of 20mm diameter and its line of stroke is radial. Minimum radius of the cam is 25mm. Draw the cam profile if the speed of cam is 300rpm clockwise. **(20 Marks)**

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