


Final Assessment Test – November 2025

 Course: **BMEE207L - Kinematics and Dynamics of Machines**

 Class NBR(s): **2338**

 Time: **Three Hours**

 Slot: **A2+TA2**

 Max. Marks: **100**

- **KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE**
- **DON'T WRITE ANYTHING ON THE QUESTION PAPER**

COs	CO Statements
CO1	Examine the kinematic behaviour of various planar mechanisms.
CO2	Construct velocity and acceleration diagrams for various planar mechanisms.
CO3	Analyse kinematics of cam and gear-train mechanisms.
CO4	Investigate the dynamic forces acting on planar mechanisms.
CO5	Analyse the balancing of masses and vibrations of mechanical systems.
CO6	Assess the characteristics of governors and gyroscopic effects.

BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

PART – A (5 X 12 = 60 Marks)

Answer ALL Questions

- Explain with neat sketch about the slider crank chain mechanism with three different applications. **CO1 BL2**
- Design a four bar mechanism to co-ordinate the input and output angles as follows: Input angles = 15°, 30° and 45° ; Output angles = 30°, 40° and 55°. **CO3 BL6**
- A multi-cylinder engine is to run at a speed of 600 r.p.m. On drawing the turning moment diagram to a scale of 1 mm = 250 N-m and 1 mm = 3°, the areas above and below the mean torque line in mm² are : + 160, – 172, + 168, – 191, + 197, – 162. The speed is to be kept within ± 1% of the mean speed of the engine. Calculate the necessary moment of inertia of the flywheel. Determine the suitable dimensions of a rectangular flywheel rim if the breadth is twice its thickness. The density of the cast iron is 7250 kg/m³ and its hoop stress is 6 MPa. Assume that the rim contributes 92% of the flywheel effect. **CO4 BL2**
- The Figure 1 shows an epicyclic gear train with the following details : A has 40 teeth external (fixed gear) ; B has 80 teeth internal ; C - D is a compound wheel having 20 and 50 teeth (external) respectively, E-F is a compound wheel having 20 and 40 teeth (external) respectively, and G has 90 teeth (external). The arm runs at 100 r.p.m. in clockwise direction. Determine the speeds for gears C, E, and B **CO3 BL5**

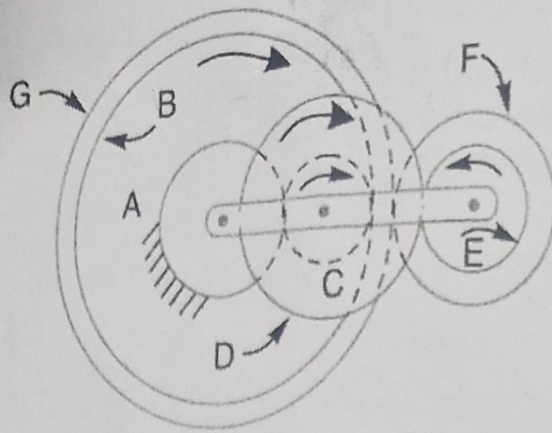


Figure 1

5. A Porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the minimum and maximum speeds and range of speed of the governor.

CO6 BL4

PART – B (2 X 20 = 40 Marks)

Answer ALL Questions

6. 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.

CO5 BL4

- 7.a) Find out the acceleration of the slider D and the angular acceleration of link CD for the engine mechanism shown in Figure 2. The crank OA rotates uniformly at 80 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.

CO2 BL4

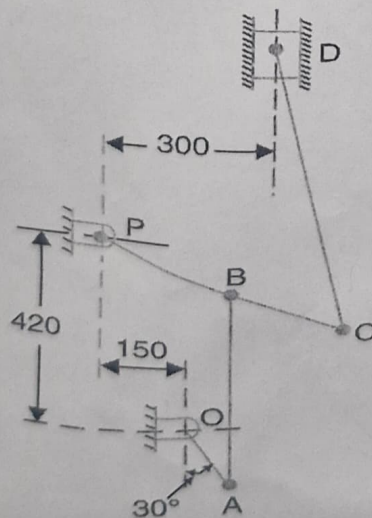


Figure 2

OR

7.b) A cam, with a minimum radius of 50 mm, rotating clockwise at a uniform speed, is required to give a knife edge follower the motion as described below :

CO2 BL6

1. To move outwards through 40 mm during 100° rotation of the cam ; 2. To dwell for next 80° ; 3. To return to its starting position during next 90° , and 4. To dwell for the rest period of a revolution i.e. 90° .

Draw the profile of the cam

(i) when the line of stroke of the follower passes through the centre of the cam shaft, and

(ii) when the line of stroke of the follower is off-set by 15 mm.

The displacement of the follower is to take place with uniform acceleration and uniform retardation.

Determine the maximum velocity and acceleration of the follower when the cam shaft rotates at 900 r.p.m.

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