

**Code: 9D15102****M.Tech I Semester Regular & Supplementary Examinations February 2016****ADVANCED MECHANISMS****(Machine Design)****(For students admitted in 2011, 2012, 2013, 2014 & 2015 only)****Time: 3 hours****Max Marks: 60**

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Derive the Gruebler's equation of mobility for planar mechanisms.
(b) The off-set slider crank mechanism is required to have a stroke length of 200 mm with connecting rod 150 mm length. Determine the maximum possible length of the crank.
- 2 (a) State the Bobillier's theorem related to inflection circle.
(b) Explain the analytical and graphical determination of d_i (inflection circle) for the given conjugate points O_m and O_r for which the ray angle is zero i.e. O_r is the centre of curvature of the path of O_m .
- 3 Construct the circling-point curve for the coupler of the four bar mechanism with the following dimensions:
Fixed link (AD) = 100 mm; Input link (AB) = 30 mm
Coupler (BC) = 40 mm; Output link (CD) = 60 mm
Angle DAB = 60° .
- 4 Explain the construction of Burmester curve related to guiding a body through four distinct positions.
- 5 State and explain the Robert's theorem with respect to path generation.
- 6 Synthesize a four-bar linkage to meet the following specifications:
Driving link: $\omega_2 = 10 \text{ rad/sec}$ $\alpha_2 = 5 \text{ rad/sec}^2$
Driving link: $\omega_3 = 2 \text{ rad/sec}$ $\alpha_3 = 15 \text{ rad/sec}^2$
Driving link: $\omega_4 = 5 \text{ rad/sec}$ $\alpha_4 = 1 \text{ rad/sec}^2$
Assume the minimum length of the link = 100 mm.
- 7 (a) Explain the D-H parameters of a prismatic-revolute planar arm.
(b) Sketch and explain SCARA industrial robot manipulator.
- 8 (a) Explain the Jacobian of the three – link arm.
(b) Obtain the singularity of the two – link planar arm.

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