

M.Tech II Semester Supplementary Examinations February 2018

ADVANCED MECHANISMS

(Production Engineering & Engineering Design)

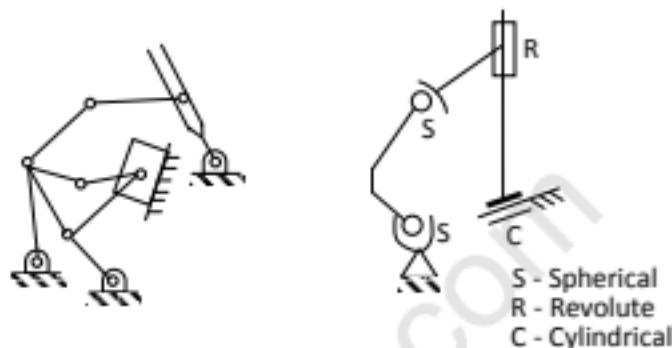
(For students admitted in 2013, 2014, 2015 & 2016 only)

Time: 3 hours

Max. Marks: 60

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Determine the mobility of linkage shown in figure below.



- (b) Define mobility of a device. Discuss the applications of Kutzbach mobility criterion.
- 2 (a) Explain virtual work and principle of virtual work.
(b) Explain with neat sketch about: (i) Hall's equation. (ii) Hartmann's construction.
- 3 (a) Explain guiding a body through a number of prescribed points.
(b) Sketch and explain polode curvature in four bar mechanism.
- 4 (a) What are the types of four bar mechanism? Explain them with neat sketch.
(b) A four bar linkage is required to generate a function $y = x^{1.6}$ for $1 \leq x \leq 3$. The input link rotates from 60° to 120° and follower link rotates from 60° to 150° . Using 3 accuracy points of Chebyshev. Find $\theta_1, \theta_2, \theta_3$ and ϕ_1, ϕ_2, ϕ_3 where θ_i is input angle ϕ_i is the output angle corresponding to its accuracy point.
- 5 (a) Explain in brief about: (i) Guiding a body through two distinct positions. (ii) Guiding a body through three distinct positions.
(b) Synthesize a four bar linkage to generate $y = \log_{10} x$, where x varies between 10 and 40. Use 3 precision points with Chebyshev spacing input starting angle $\Psi_s = 45^\circ$ and $\Delta\Psi = 60^\circ$, $\Delta\phi = 90^\circ$. Fixed link length 100 mm. Plot the mechanism.
- 6 Synthesize a four bar linkage to give the following values for the angular velocities and accelerations: $\omega_2 = 130 \text{ rad/s}$; $\omega_3 = 200 \text{ rad/s}$; $\omega_4 = 85 \text{ rad/s}$
 $\alpha_2 = 0 \text{ rad/s}^2$; $\alpha_3 = -1200 \text{ rad/s}^2$; $\alpha_4 = -10000 \text{ rad/s}^2$
- 7 Discuss important kinematic analysis of following:
(a) D-H transformation matrix.
(b) PUMA & STANFORD ARM.
- 8 Explain:
(a) Mobility criterion for planar mechanisms.
(b) Mobility criterion for spatial mechanisms and manipulators.