Code No: 5215AB

R15

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech I Semester Examinations, February - 2017
ADVANCED MECHANICS OF MACHINERY
(Machine Design)

Time: 3hrs **Max.Marks:75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

5 × 5 Marks = 25

1.a) Derive the analytical expression for the Euler-Savary equation for the location of a conjugate point. [5]
b) Derive an expression for the Hall's equation by considering the Polode's curvature. [5]
c) What is transmission angle? How it overcomes the limitations of Grashof's rule? [5]
d) Derive the characteristic equation of four bar mechanism. [5]
e) Explain function generation with three precision points and five precision points. [5]

PART - B

5 × 10 Marks = 50

2.a) Write a short note on Bobillier's theorem and verify the correctness of the theorem.
b) Construct the inflection circle for link 3 of the conchoidograph shown below Figure1. [4+6]

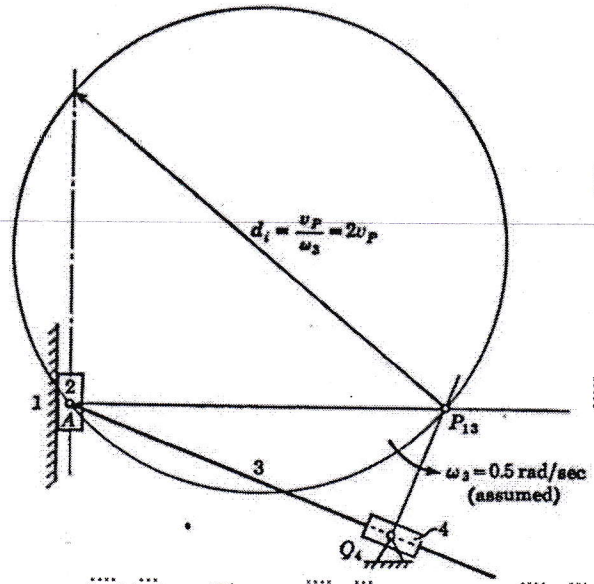

Figure 1

OR

3.a) Derive the Hartmann's method of determining the inflection circle.
b) The below figure 2 shows the skeleton of a certain steam valve actuating mechanism whose input crank 2 revolves at constant speed. Determine the angular acceleration of link 4 and acceleration of C. [4+6]

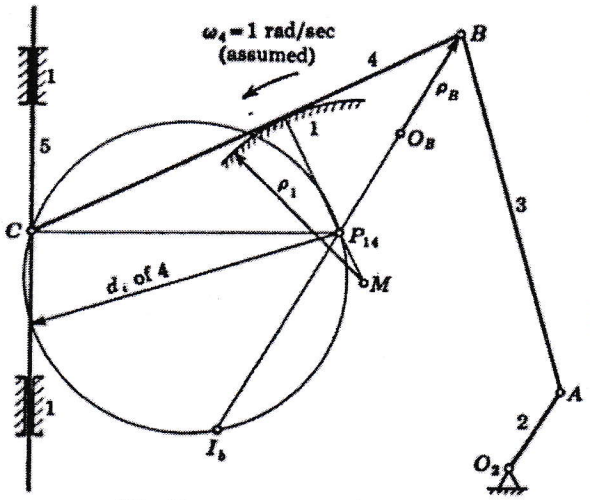

Figure 2

4.a) Determine the Polode curvatures for the coupler 3 of the four bar mechanism of the figure 3 shown below.

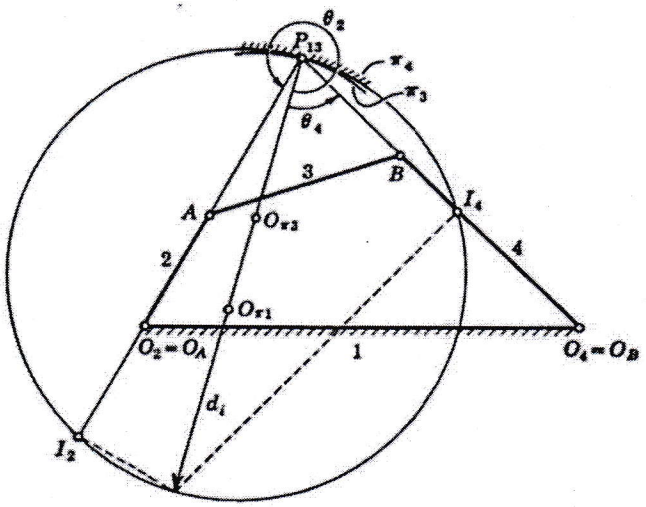

Figure 3

b) Write a short note on Freudenstein's collineation axis theorem. [6+4]

OR

5.a) Describe the circling point curvature for the coupler of a four bar mechanism with an example.

b) Discuss briefly about the Carter –Hall circle as the kinematic property. [5+5]

6.a) Explain the operation of crank rocker mechanism as quick return motion mechanism.

b) Explain the procedure for guiding a body through four distinct positions? [5+5]

OR

7.a) Explain the procedure for guiding a body through two distinct positions?

b) The body r (in below figure 4) is hinged at A to the oscillating lever q, pivoted to the frame at O_q. The point B is to move through collinear positons B_1, B_2, B_3 and B_4. A second guiding link s is to complete a suitable four bar linkage. [4+6]

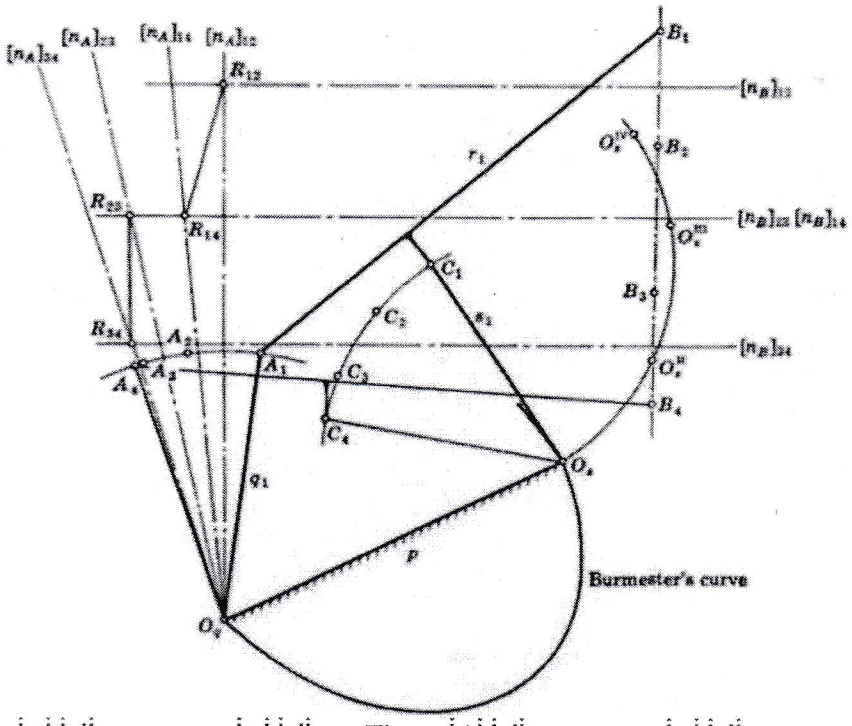

Figure 4

8.a) Explain the function generation using relative Rotocenter method.

b) Design a slider crank mechanism for generation function $y=\log_{10} x$, with precision points at x= 1,2, 3 and 4; that is y=0, 0.30103, 0.47712 and 0.60206. The independent variable x is represented by the horizontal displacement of the slider from right to left and the independent variable y by a counter clockwise rotation of the crank. [4+6]

OR

9.a) Mechanize the function $y=\sin^2 x$ within the range $0<x<90^o$, with precision points $x_1=0$, $y_1=0$; $x_2=22^o30'$, $y_2=0.1465$; $x_3=45^o$, $y_3=0.50$; $x_4=67^o30'$, $y_4=0.8535$; and $x_5=90^o$, $y_5=1.0$.

b) Explain the function generation using Overlay method. [6+4]

10.a) The mechanism shall satisfy the following data.
Driving link: $\omega_q=10$ rad/sec, and $\alpha_q=0$
Coupling rod: $\omega_r=2$ rad/sec, and $\alpha_2=15$rad/sec^2.
Driven link: $\omega_s=5$ rad/sec and $\alpha_s=10$ rad/sec^2
Find the link ratios of mechanism?

b) Explain briefly the synthesis of four bar mechanism prescribed for extreme values of the angular velocity of the driven link using method of components. [5+5]

OR

11.a) The mechanism shall satisfy the following particulars:
Fixed link: p=3.375 in
Driving link: $\omega_q=10$ rad/sec, and $\alpha_q=0$
Driven link: $s_x= 4$ in, $s_x= 4.625$ in, $\omega_s=10$ rad/secand $\alpha_s=10$ rad/sec^2.
Find the angular velocity of coupler ω_r.

b) Design a crank-rocker mechanism to the following specifications:
$\omega_q=10$ rad/sec, $\omega_{s1}=6$ rad/sec, $\omega_{s2}= -8$ rad/sec and p= 10 in. [5+5]

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