



JK Lakshmipat University Jaipur

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, April-May 2015
B. Tech. in Mechanical Engineering, Semester IV

Roll No.....

ME407: Kinematics of Machines

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A	Objective type questions (10 questions @ 1 mark)	10
i.	Define Grashoff's law	
ii.	A solid disc of radius r rolls without slipping on the horizontal floor with angular velocity ω and angular acceleration α . The magnitude of acceleration of the point of contact on the disc is	
iii.	Name the applications of crank and slotted lever quick return motion mechanism	
iv.	Define double slider crank chain mechanism	
v.	A point E on a rigid link DE moves with respect to D with angular velocity ω rad/s. the total acceleration of E with respect to D will be equal to.....	
vi.	Match the items in column I and II Column I P. Higher Kinematic pair Q. Lower kinematic pair R. Quick return mechanism S. Mobility of a linkage (a) P-2, Q-6, R-4, S-3, (b) P-6, Q-2, R-4, S-1, (c) P-6, Q-2, R-5, S-3, (d) P-2, Q-6, R-5, S-1 Column II 1. Grubler's equation 2. Line contact 3. Euler's equation 4. Planer 5. Shaper 6. Surface contact	
vii.	For a four bar mechanism, the Freudenstein's equation is	
viii.	The number of degrees of freedom of a five link plane mechanism with five revolute pairs as shown in the Figure 1 , ...	

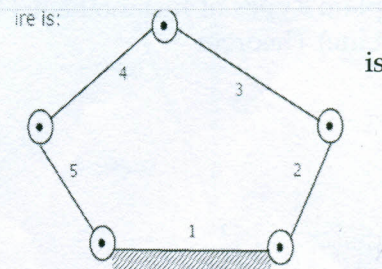
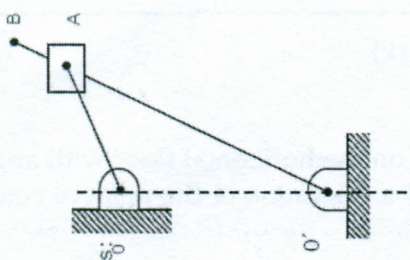
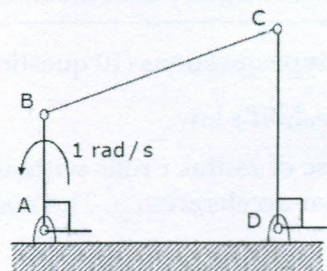
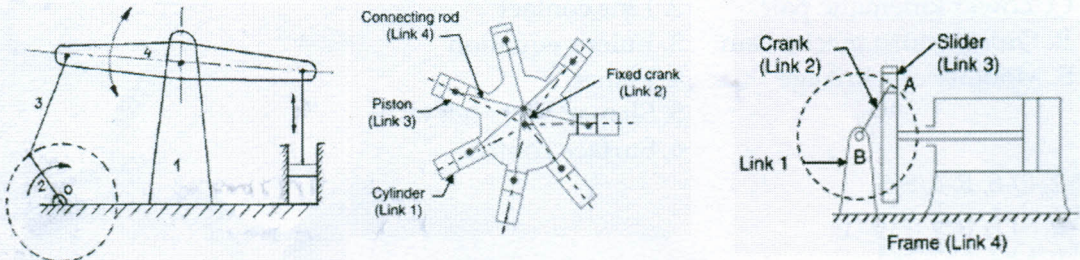


Fig. 1

ix.	The relative acceleration of two points which are at variable distance apart on a moving link can be determined by using the method.	
x.	The synthesis of mechanism deals with the determination of of the links in a mechanism	
Q.1B	Short answer type questions (2 questions @ 2.5 marks)	10
a)	Figure 2 shows a quick return mechanism. The crank OA rotates clockwise uniformly. $OA = 2\text{ cm}$, $O'O = 4\text{ cm}$. calculate the ratio of time for forward motion to that for return motion.	
b)	Write note on complete and incomplete constraints motion in lower and Higher Pairs, illustrate your answer with neat sketches.	
c)	For the four-bar linkage shown in the Figure 3 , the angular velocity of link AB is 1 rad/s . the length of link CD is 1.5 times the length of link AB. Find out the angular velocity (in rad/s) of link CD.	
	 	
d)	Write any three rules to locate Instantaneous center	
Q.2A	Explain the different types of joints	5
Q.2B	Explain inversion of basic single slider crank chain	5
Q.3A	Define Number of degree of freedom and determine the number of degree of freedom for the mechanisms shown in Fig.4 (a, b & C)	5
		
Q.3B	Explain Types of Instantaneous Centres and also state Aronhold Kennedy (or Three Centres in Line) Theorem	5

Q.8	Design a four bar mechanism to co-ordinate the input and output angles as follows: Input angles = $15^\circ, 30^\circ, 45^\circ$ Output angles = $30^\circ, 40^\circ, 55^\circ$	10
OR		
Q.8	Synthesize a slider crank mechanism so that the displacement of the slider is proportional to the square of the crank rotation in the interval $45^\circ \leq \theta \leq 135^\circ$. use three precision points with Chebyshev's spacing.	10
Q.9A	Derive the expressions for displacement of a four bar mechanism.	5
Q.9B	Describe the classification of synthesis problem.	5

