

PRN No.

PAPER CODE

U314-2113 [ESE]

(AY:2024-25) December 2024 (ENDSEM) EXAM  
TY (SEMESTER - I)COURSE NAME: Kinematics and  
Theory of Machines

Branch: Mechanical

COURSE CODE: MEUA31203

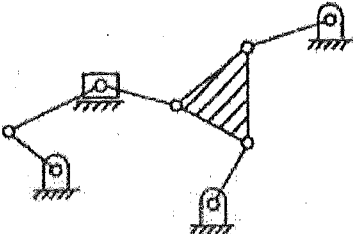
(T.Y PATTERN 2020)

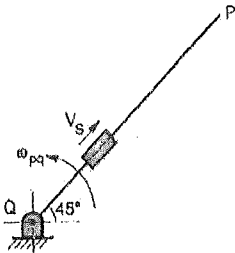
Time: [1Hr 30 Min]

[Max. Marks: 40]

(\*) Instructions to candidates:

- 1) Figures to the right indicate full marks. Use of scientific calculator is allowed
- 2) Use suitable data wherever required
- 3) All questions are compulsory. Solve any two sub question each from Questions 1 and 2
- 4) Solve any one sub question (2 marks) from Questions 3 ,4 ,5 and 6 and sub question of 4 marks is compulsory from questions 3,4,5,and 6

Q. No.	Question Description	Max. Marks	CO mapped	BT Level
Q.1	a) Explain the inversions of double- slider crack chain in detail and Give example for each inversion.	[4]	CO1	Apply
	b) Calculate out the degrees of freedom (DOF) for the following mechanism shown in figure 1.	[4]	CO1	Apply
	 <p style="text-align: center;"><b>Figure 1.</b></p>	[4]	CO1	Apply
c) Differentiate with giving examples: <ul style="list-style-type: none"> <li>• Close and unclose pair.</li> <li>• Turning pair and rolling pair.</li> </ul>	[4]	CO1	Apply	
Q2	a) Apply the angular velocity ratio theorem using a four-bar chain mechanism based on the concept of the instantaneous centre of rotation (ICR) and derive the expression for it.	[4]	CO2	Apply
	b) The crank and connecting rod of steam engine are 0.3 m and 1.5 m in length. The crank rotates at 250 rpm clockwise. Determine by analytical method the velocity and acceleration of the piston when the crank is 50° from I.D.C. position.	[4]	CO2	Apply

	<p>c) The crank and connecting rod of a steam engine are 0.5m and 2m long respectively. The crank makes 180rpm in clockwise direction. When it has turned through <math>45^\circ</math> from inner dead center, find the velocity of piston and angular velocity of connecting rod by ICR method.</p>	[4]	CO2	Apply	
Q3	<p>a) Illustrate the linear velocity and angular velocity of a body and state their SI units. OR b) Describe the term "Klien's construction".</p>	[2]	CO3	Understand	
	<p>c) Express "Coriolis component of acceleration"? Find the direction of this acceleration for slider in the case shown in figure 2.</p>	[2]	CO3	Understand	
	<p>[4]</p>	CO3	Apply		
	 <p style="text-align: center;"><b>Figure 2.</b></p>				
Q4	<p>a) Compare the main tooth profile of gear teeth which fulfill the law of gearing? OR b) Describe the following term used in gears 1) Module 2) Arc of contact</p>	[2]	CO4	Understand	
	<p>c) Two gears having 40 and 50 involute teeth respectively are in mesh. The module of gear is 10mm and angle of obliquity is <math>20^\circ</math>. The line of contact on each side of the pitch is two third of maximum possible length. Find addendum on pinion and gear.</p>	[2]	CO4	Understand	
	<p>[4]</p>	CO4	Apply		
Q.5	<p>a) Explain the construction and working details of "Simple gear train". OR b) Provide a detailed explanation of a reverted gear train, accompanied by a clear and precise sketch.</p>	[2]	CO5	Understand	
	<p>c) The arm of an epicyclic gear train rotates at 100rpm in an anticlockwise direction. The arm carries two-wheel A and B having 36 and 45 teeth respectively. The wheel A is fixed and the arm rotates about the centre of wheel A. find the speed of wheel B. if the wheel A makes 200 rpm. Clockwise?</p>	[2]	CO5	Understand	
	<p>[4]</p>	CO5	Apply		

Q.6	a) Illustrate the key requirements for an effective braking system.	[2]	CO6	Understand
	OR			
	b) Explain the working principle of "Cone Clutch".	[2]	CO6	Understand
	c) An automobile single plate clutch consists of a pair of contacting surfaces. The inner and outer radii of friction plate are 120mm and 250mm respectively. The coefficient of friction is 0.25 and the total axial force is 15kN. Calculate the power transmitting capacity of the clutch at 500 r.p.m by using: 1. Uniform wear theory 2. Uniform pressure theory	[4]	CO6	Apply

