(3)

Total No of Questions: [08]	*SEAT NO. :*

[Total No. of Pages : 3]

S. E. (Mechanical / Mech. sand. /Automobile) 2012 course

Theory of Machines-I

(Semester - II)

Time: 2 Hours ***Max. Marks : 50***

Instructions to the candidates:

(1) Answer (Q1) or (Q2), (Q3) or (Q4), (Q5) or (Q6) (Q7) or (Q8)

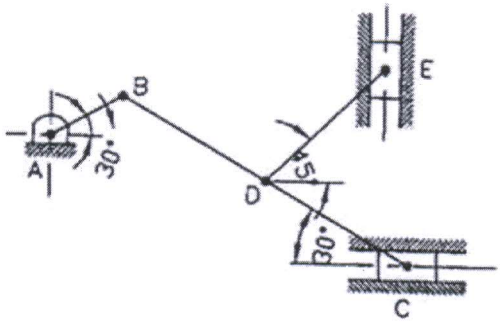
(2) Neat diagrams must be drawn whenever necessary.

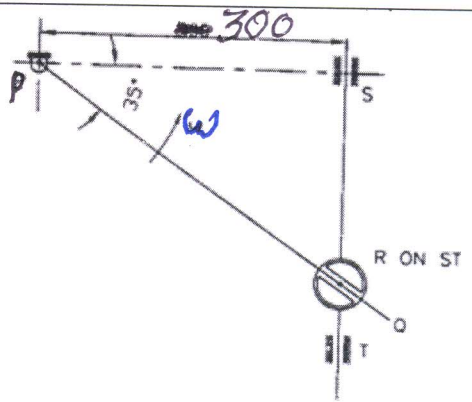
(3) Figures to the right indicate full marks.

(4) Use of calculator is allowed.

(5) Assume suitable data whenever necessary.

Q1)	a)	What is meant by a 'steering gear mechanism' ? Derive an expression for correct steering condition?	[6]
	b)	Explain the concept of Friction Circle and Friction axis.	[4]
		OR	
Q2)	a)	Explain Equivalent linkage of mechanism with two examples.	[4]
	b)	Derive an expression for correction couple to be applied to make a connecting rod to be dynamically equivalent, when two masses are placed one at crank pin and the other gudgeon pin.	[6]
Q3)	a)	A single plate clutch transmits 25 kW at 900 rpm. The maximum pressure intensity between the plates is 85 kN/m^2. The outer diameter of plate is 360 mm. Both the sides of the plate are effective and the coefficient of friction is 0.25. Determine 1. inner diameter of plate 2. axial force to engage the clutch.	[6]
	b)	Draw neat and properly labeled Polar diagram for Single Hooke's joint.	[4]
		OR	
Q4)	a)	Using Complex algebra method, Determine velocity of piston and angular velocity of connecting rod for inline slider crank mechanism. Crank length = 100 mm, Obliquity ratio = 4.5 Speed of crank = 120 rpm in counter clockwise direction, Crank makes 45^0 angle with IDC position.	[6]
	b)	Explain self locking and self energizing condition for differential band brake.	[4]

Q5)	a)	For mechanism shown Fig. 1, crank rotates in clockwise direction with angular velocity of 80 rad/s . Determine velocity of piston E, angular velocity magnitude and direction for of link BC and DE, using three centers method. Also state the corollary used to decide the direction of angular velocity.  **Figure 1: Q5) a)** (Fig drawn is not to the scale)	[12]
	b)	Explain Acceleration Image Principle.	[3]
		OR	
Q6)	a)	For mechanism shown Fig.1, crank rotates in clockwise direction with angular velocity of 100 rad/s, angular velocity of link DE is 37 rad/s in counterclockwise direction and angular velocity of link BC is 33 rad /s in counterclockwise direction. Determine acceleration of piston E, angular acceleration of link BC and DE. (No need to draw velocity polygon)	[12]
	b)	Discuss various types of instantaneous centre with example.	[3]
Q 7)	a)	In the mechanism shown in the following Fig. 2, the link PQ is free to turn about end P & at the same time, its freely slides in a slotted trunnion R. The slotted trunnion is carried on second link 'ST' which freely slides vertically in the guides. Draw acceleration diagram at the instant when PQ makes an angle of 35^0 to the horizontal & is rotating with angular velocity of 30 rad / sec. Hence, determine acceleration of link ST.	[11]

		 **Figure 2:Q7) a)**	
	b)	Prove that the velocity polygon obtained using Klien's construction for slider crank mechanism is to the scale of **'1:xω'** where x is the scale with which configuration diagram is drawn.	[4]
		OR	
Q8)	a)	The crank an I.C engine is 200 mm long and the Obliquity ratio is 4. Determine the acceleration of piston, angular acceleration of connecting rod, when is turned through 45^0 from i.d.c position and instantaneous speed of rotation of crank is 240 rpm clockwise and increasing at the rate of 100 rad/s^2.	[11]
	b)	Derive an expression for Magnitude of coriolis component of acceleration.	[4]