Model Question Paper-2 with effect from 2019-20 (CBCS Scheme)

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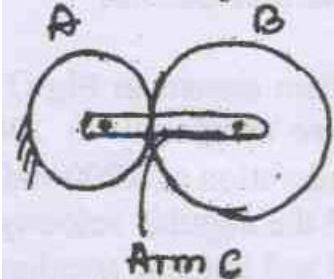**Fourth Semester B.E. Degree Examination**
Kinematics of Machines

TIME: 03 Hours   Max. Marks: 100

Note: Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module -1	***Bloom's Taxonomy Level**	**Marks**
Q.01	a	Sketch and explain the kinematic chain with three lower pairs .	L2	05
	b	Explain the Grubler's Mobility equation for a planar mechanism. Determine the mobility of a cam with an oscillating follower fitted with a roller.	L2	05
	c	Illustrate with neat figures two inversions of double slider crank chain.	L2	10
		OR		
Q.02	a	Compare between a) Higher pair and lower pair b) Kinematic pair and Kinematic chain c) Constrained motion and unconstrained motion	L2	08
	b	Outline inversions of kinematics chain. With the help of a neat sketch explain inversions of single slider crank chain.	L2	12
		Module-2		
Q. 03	a	Explain the double rocker mechanism with neat sketch.	L2	10
	b	Explain with a neat sketch, pantograph mechanism. State its applications.	L2	10
		OR		
Q.04	a	Explain the followings with the help of neat sketch Robert mechanism .	L2	10
	b	Explain the Toggle mechanism, with neat sketch.	L2	10
		Module-3		
Q. 05		A four chain bar a fixed link AD= 1m, driving crank AB= 0.3m, follower link CD= 0.6m and the connecting link BC= 1.2m. The crank AB rotates at a speed of 300 rpm clockwise with an angular acceleration of 200 rad/sec^2 in anti-clockwise direction. When the angle made by the crank with the fixed link is 135° in anti-clockwise direction. Construct: a) Angular velocity of link BC and CD b) Acceleration of B&C	L3	20
		OR		
Q. 06		PQRS in a four bar chain with link PS fixed. The lengths of the link are PQ=62.5mm, QR= 175mm, RS=112.5mm and PS=200mm. Draw the velocity and acceleration diagram when angle QPS=60° and Q & R lie on the same side of PS. Construct the angular velocity and angular acceleration of links QR & RS.	L3	20
		Module-4		

Q. 07	a	Two spur gear wheels have 23 and 57 teeth. The profile of both the gear wheels is involute with pressure angle of 20°, module 8 mm and addendum equals one module. Identify the length of path of contact and arc of contact	L3	10

	b	In an epicyclic gear train, the internal wheels A and B and the compound wheels C and D rotate independently about axis O. The wheels E and F rotate on pins fixed to the arm G. The wheel E gears with A and C, and the wheel F gears with B and D. All the wheels have the same module. The number of teeth are $T_C = 28$, $T_D = 26$, $T_E = T_F = 18$.
		  i) Sketch the arrangement
		  ii) Identify the number of teeth on wheels A and B.
		  iii) If arm G rotates at 100 rpm clockwise and wheel A is fixed, find the speed of wheel B.
		  iv) If arm G rotates at 100 rpm clockwise and wheel A makes 10 rpm anticlockwise, find the speed of wheel B.
			L3	10

		OR		
Q. 08	a	Two gears in mesh have 28 and 45 teeth respectively and standard addendum of one module. The module and pressure angle are 6 mm and 20° respectively. Analyze: i) Contact ratio, ii) Angle turned by pinion and gear when one pair of teeth is in contact, iii) The ratio of sliding to rolling motion when the tip of a tooth on the larger wheel is just making contact, is just leaving contact with its mating tooth, and is at the pitch point.	L4	10
	b	In an epicyclic gear train shown in figure, an arm (**C**) carries gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 rpm in *anticlockwise* direction about the centre of gear – A which is fixed, determine the speed of gear B. If gear A instead of being fixed, makes 300 rpm in the *clockwise* direction, Analyze the speed of gear B. 	L4	10
		Module-5		
Q. 09	a	Construct the profile of a cam operating a knife edge follower having a lift of 30 mm. The cam raises the follower with simple harmonic motion for 150° of the rotation followed by a period of dwell for 60°. The follower descends for the next 100° rotation of the cam with uniform velocity, again followed by a dwell period. The cam rotates at a uniform speed of 120 rpm and has a least radius of 20 mm. What will be the maximum velocity and acceleration of the follower during the lift and the return?	L3	20
		OR		
Q. 10	a	The following data relate to a cam profile in which, the roller follower moves with uniform acceleration and retardation motion during ascent and descent. Minimum radius of cam = 25 mm. Roller radius = 8 mm. Lift = 32 mm, offset of follower axis = 12 mm towards right, angle of ascent = 60°, angle of descent = 90°, angle of dwell between ascent and descent = 45°, speed of cam = 20 rpm clockwise. Construct the profile of cam. Calculate the maximum velocity and acceleration of the follower	L3	20

		during descent and accent period.		

*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.