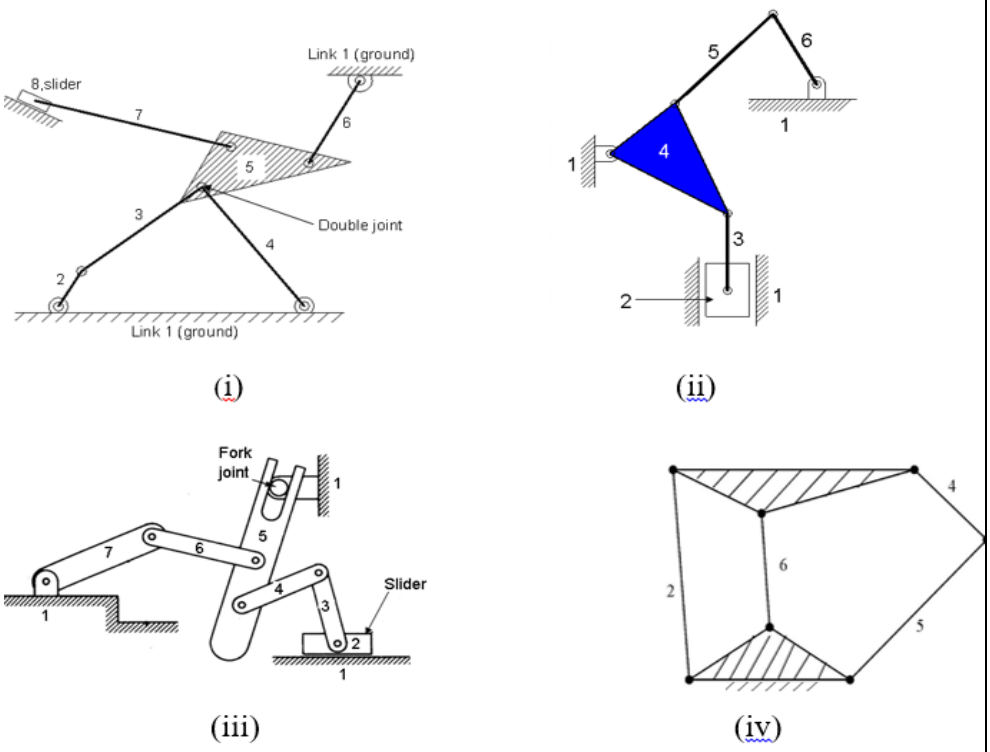
Model Question Paper-2 with effect from 2019-20 (CBCS Scheme)

USN | | | | | | | | | | |

Fourth Semester B.E. Degree Examination
Theory of Machines

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
02. Sketches should be neat and clear.

		Module -1	*Bloom's Taxonomy Level	Marks
Q.01	a	Explain the term kinematic link. Give the classification of kinematic link and mention an example for each.	L1	6
	b	For a particular application, rotary motion is to be allowed only in one direction while preventing the motion in opposite direction. Mention the mechanism that could be used. Sketch and explain the same.	L4	6
	c	Determine the number of inputs required for operating the following mechanisms shown in Figure 2 (c).  Figure 1(c)	L3	8
		OR		
Q.02	a	In what way a mechanism differ from a machine?	L1	4
	b	With a neat sketch explain the Ackerman steering gear mechanism. Derive the condition for correct steering.	L2	8
	c	In a crank and slotted lever quick return motion mechanism, the distance between the fixed centers is 240 mm and the length of the driving crank is 120 mm. Find the inclination of the slotted bar with the vertical in the extreme position and the time ratio of cutting stroke to the return stroke. If the length of the slotted bar is 450 mm, find the length of the stroke if the line	L3	8

		of stroke passes through the extreme positions of the free end of the lever.		
		Module-2		
Q. 03	a	Explain the types of friction and state the laws of friction.	L1	6
	b	Two parallel shafts whose centre lines are 4.8 m apart are connected by open belt drive. The diameter of larger pulley is 1.5 m and that of smaller pulley 1 m. The initial tension in the belt when stationary is 3 kN. The mass of the belt is 1.5 kg/m length. The coeff of friction between belt and pulley is 0.3. Taking centrifugal tension in to account, Calculate power transmitted when smaller pulley rotates at 400 rpm.	L3	14
		OR		
Q.04	a	Derive from first principles an expression for the friction moment of a conical pivot assuming Uniform pressure	L2	10
	b	A shaft rotating at 200 r.p.m. drives another shaft at 300 r.p.m. and transmits 6 kW through a belt. The belt is 100 mm wide and 10 mm thick. The distance between the shafts is 4m.The smaller pulley is 0.5 m in diameter. Calculate the stress in the belt, if it is an open belt drive	L3	10
		Module-3		
Q. 05	a	Explain clearly the terms 'static balancing' and 'dynamic balancing'. State the necessary conditions to achieve them.	L2	4
	b	Wheel balancing is one of the preferred activities for the car wheels. What is the reason for this?	L4	4
	c	A four cylinder vertical engine has cranks 150 mm long. The planes of rotation of the first, second and fourth cranks are 400 mm, 200 mm and 200 mm respectively from the third crank and their reciprocating masses are 50 kg, 60 kg and 50 kg respectively. Find the mass of the reciprocating parts for the third cylinder and the relative angular positions of the cranks in order that the engine may be in complete primary balance.	L3	12
		OR		
Q. 06	a	The secondary unbalanced force due to reciprocating masses is 1/n times the maximum primary unbalanced force where 'n' is the ratio of length of the connecting rod to the crank radius. Prove.	L3	8
	b	A, B, C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance.	L3	12
		Module-4		
Q. 07	a	What is stability of a governor? Sketch the controlling force versus radius diagrams for a stable, unstable and isochronous governor.	L2	6
	b	Explain the application of gyroscopic principles to aircrafts.	L2	6
	c	A horizontal axle AB, 1 m long, is pivoted at the midpoint C. It carries a weight of 20 N at A and a wheel weighing 50 N at B. The wheel is made to spin at a speed of 600 r.p.m in a clockwise direction looking from its front. Assuming that the weight of the flywheel is uniformly distributed around the rim whose mean diameter is 0.6 m, calculate the angular velocity of precession of the system around the vertical axis through C. What is the effect of variation in the magnitude of weight at A on the angular velocity of precession and its direction?	L4	8
		OR		
Q. 08	a	Discuss the effect of the gyroscopic couple on a two wheeled vehicle when taking a left turn.	L2	8
	b	The radius of rotation of the balls of a Hartnell governor is 80 mm at the minimum speed of 300 rpm. Neglecting gravity effect, determine the speed after the sleeve has lifted by 60 mm. Also determine the initial compression of the spring, the governor effort and the power. The particulars of the governor are given below: Length of ball arm = 150 mm ; length of sleeve arm = 100 mm ; mass of each ball = 4 kg ; and stiffness of the spring = 25 N/mm.	L3	12

		Module-5		
Q. 09	a	Give the classification of cam types.	L1	3
	b	What is the advantage of using offset follower over in-line follower ?	L4	3
	c	From the following data, draw the profile of a cam in which the follower moves with simple harmonic motion during ascent while it moves with uniformly accelerated motion during descent : Least radius of cam = 50 mm ; Angle of ascent = 48° ; Angle of dwell between ascent and descent = 42° ; Angle of descent = 60° ; Lift of follower = 40 mm ; Diameter of roller = 30 mm ; Distance between the line of action of follower and the axis of cam = 20 mm	L3	14
OR				
Q. 10	a	Draw the displacement diagram for the follower moving with SHM during the ascent and uniform velocity during descent.	L2	6
	b	Draw the profile of a cam with oscillating roller follower for the following motion : (a) Follower to move outwards through an angular displacement of 20° during 120° of cam rotation. (b) Follower to dwell for 50° of cam rotation. (c) Follower to return to its initial position in 90° of cam rotation with uniform acceleration and retardation. (d) Follower to dwell for the remaining period of cam rotation. The distance between the pivot centre and the roller centre is 130 mm and the distance between the pivot centre and cam axis is 150 mm. The minimum radius of the cam is 80 mm and the diameter of the roller is 50 mm.	L3	14

*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.