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

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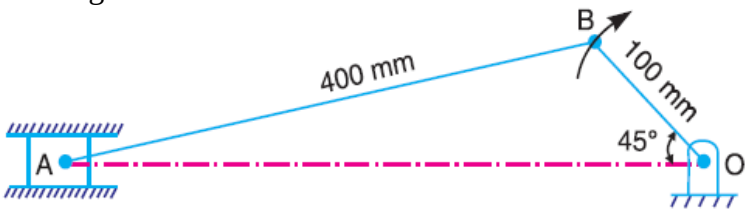
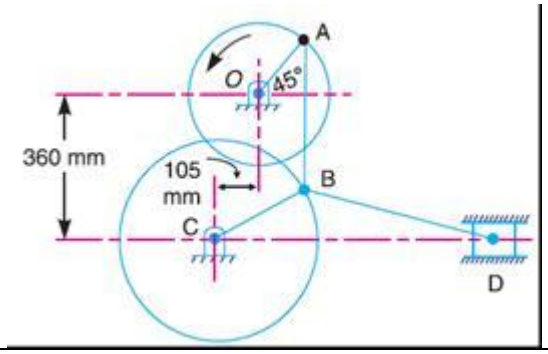
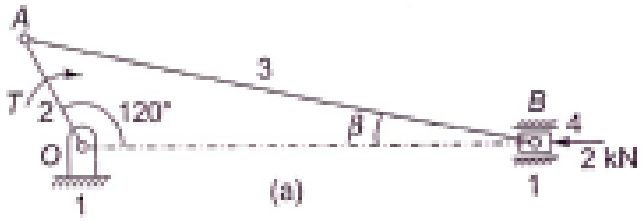
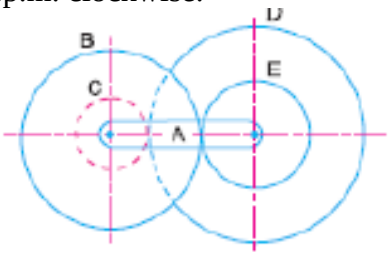
Fourth Semester B.E. Degree Examination

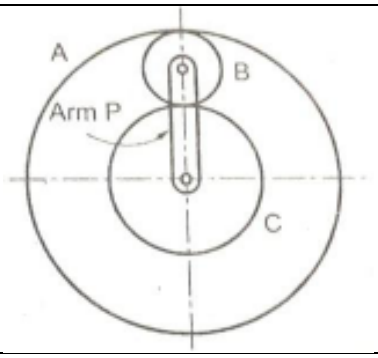
18AS44 - MECHANISMS AND MACHINE THEORY

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

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
02.
03.

		Module -1	*Bloom's Taxonomy Level	Marks
Q.01	a	Write short notes: i) the machine and structure,ii) Kinematic Pair, iii)degree of freedom iv) Grubler's criterion	L1	8
	b	Explain the inversions of their Four Bar link mechanism with examples.	L1	12
	c			
		OR		
Q.02	a	Explain with neat sketches: i) Ratchet and pawl mechanism ii) Ackerman steering gear mechanism iii) Geneva wheel mechanism	L1	10
	b	Explain the inversions of their Double slider crank mechanism with examples	L1	10
	c			
		Module-2		
Q. 03	a	Locate all the instantaneous centres of the slider crank mechanism as shown in Fig.The lengths of crank OB and connecting rod AB are 100 mm , OBA 45° and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find: 1. Velocity of the slider A,and 2. Angular velocity of the connectingrodAB. 	L3	10
	b	In the toggle mechanism shown in Fig., the slider D is constrained to move on a horizontal path. The crank OA is rotating in the counter-clockwise direction at a speed of 180 r.p.m. increasing at the rate of 50 rad/s2. The dimensions of the various links are as follows: OA = 180 mm ; CB = 240 mm ; AB = 360 mm ; and BD = 540 mm. For the given configuration, find 1. Velocity of slider D and angular velocity of BD, and 2. Acceleration of slider Dand angular acceleration of BD. 	L3	10
	c			

		OR		
Q.04	a	A slider crank mechanism with the following dimension is acted upon by a force F =2kN at B as shown in Fig QA =100mm, AB=450mm Determine the input torque T on the link OA for the static equilibrium of the Mechanism for the given configuration 	L3	14
	b	Distinguish between the Static and Dynamics force	L1	6
	c			
		Module-3		
Q. 05	a	Derive an expression to determine the Arc of path of contact between two spur gears of different size.	L2	10
	b	A pair of involute spur gears with 16° pressure angle and pitch of module 6 mm is in mesh. The number of teeth on pinion is 16 and its rotational speed is 240 r.p.m. When the gear ratio is 1.75, find in order that the interference is just avoided; 1. The addenda on pinion and gear wheel; 2. The length of path of contact; and 3. The maximum velocity of sliding of teeth on either side of the pitch point.	L3	10
	c			
		OR		
Q. 06	a	In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D - E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 r.p.m. clockwise. 	L3	10
	b	In an epicyclic gear train an annular wheel A having 54 teeth meshes with a planet wheel B which gears with a sun wheel C, the wheels A & C being coaxial the wheel B is carried on a pin fixed on one end of arm P which rotates about the axis of the wheels A&C` if the wheel A makes 20 rpm in a clockwise sense and the arm rotates at 100 rpm. In the Anticlockwise direction and the wheel C has 24 teeth, Determine the speed and sense of rotation of wheel C.	L3	10

				
	c			
		Module-4		
Q. 07	a	A shaft carries four masses in parallel planes A, B, C and D in this order along its length. The masses at B and C are 18 kg and 12.5 kg respectively, and each has an eccentricity of 60 mm. The masses at A and D have an eccentricity of 80 mm. The angle between the masses at B and C is 100° and that between the masses at B and A is 190°, both being measured in the same direction. The axial distance between the planes A and B is 100 mm and that between B and C is 200 mm. If the shaft is in complete dynamic balance, determine : 1. The magnitude of the masses at A and D ; 2. the distance between planes A and D ; and 3. the angular position of the mass at D.	L3	10
	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	10
	c			
		OR		
Q. 08	a	Derive the following expressions, for an uncoupled two cylinder locomotive engine: (*a*) Variation is tractive force; (*b*) Swaying couple; and (*c*) Hammer blow.	L2	10
	b	An inside cylinder locomotive has its cylinder centre lines 0.7 m apart and has a stroke of 0.6 m. The rotating masses per cylinder are equivalent to 150 kg at the crank pin, and the reciprocating masses per cylinder to 180 kg. The wheel centre lines are 1.5 m apart. The cranks are at right angles. The whole of the rotating and 2/3 of the reciprocating masses are to be balanced by masses placed at a radius of 0.6 m. Find the magnitude and direction of the balancing masses. Find the fluctuation in rail pressure under one wheel, variation of tractive effort and the magnitude of swaying couple at a crank speed of 300 r.p.m.	L3	10
	c			
		Module-5		
Q. 09	a	*T*he arms of a Porter governor are each 250 mm long and pivoted on thegovernor axis. The mass of each ball is 5 kg and the mass of the central sleeve is 30 kg. The radius of rotation of the balls is 150 mm when the sleeve begins to rise and reaches a value of 200 mm for maximum speed. Determine the speed range of the governor. If the friction at the sleeve is equivalent of 20 N of load at the sleeve, determine how the speed range is modified.	L3	10
	b	Explain with neat sketch Hartnell governor	L1	10
	c			
		OR		
Q.	a	Explain the effect of Gyroscope couple on an Aircraft.	L1	8

10				
	b	The turbine rotor of a ship has a mass of 2000 kg and rotates at a speed of 3000 r.p.m. clockwise when looking from a stern. The radius of gyration of the rotor is 0.5 m. Determine the gyroscopic couple and its effects upon the ship when the ship is steering to the right in a curve of 100 m radius at a speed of 16.1 knots (1 knot = 1855 m/hr). Calculate also the torque and its effects when the ship is pitching in simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 50 seconds and the total angular displacement between the two extreme positions of pitching is 12°. Find the maximum acceleration during pitching motion.	L3	12
	c			

*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.