Model Question Paper-1 with effect from 2019-20 (CBCS Scheme)

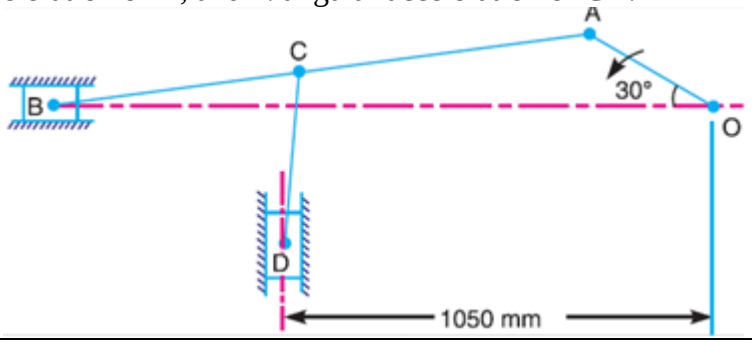
USN | | | | | | | | | | |

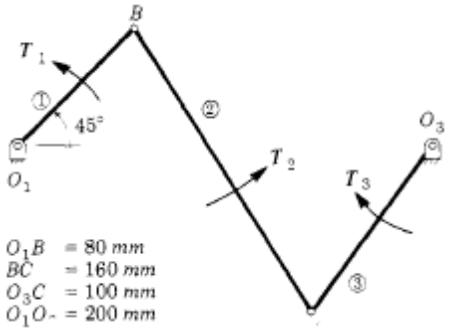
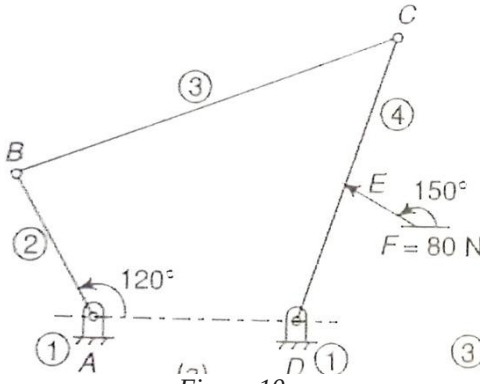
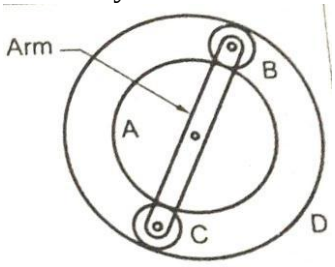
Fourth Semester B.E. Degree Examination

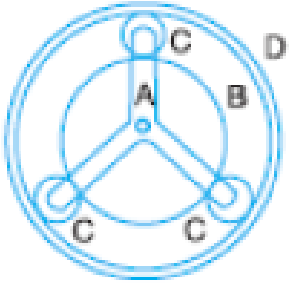
18AS44 - MECHANISMS AND MACHINE THEORY

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	Define the following : i. Kinematic chain & pair ii.Mechanism iii,Degree of freedom	L1	8
	b	Explain the inversions of their slider crank mechanism with examples.	L1	12
	c			
		OR		
Q.02	a	Sketch and explain the following i. Elliptical Trammel ii. Whitworth quick return motion Mechanism	L1	10
	b	With a neat sketch, explain the condition for correct steering for Ackelmann's mechanism	L1	10
	c			
		Module-2		
Q. 03	a	PQRS in a four bar chain with link PS fixed. The length of the link are PQ=62.5mm,QR=175mm,RS=112.5mm and PS=200mm. the crank PQ rotates at 10 rad/sec clockwise. Draw the velocity and acceleration diagram when angles QPS=60° and Q and R lie on the same side PS. Find the angular velocity and angular acceleration of link QR and RS.	L3	10
	b	In the mechanism, as shown in Fig.8, the crank OA rotates at 20r.p.m. anticlockwise and gives motion to the sliding blocks B and D. The dimensions of the various links are OA = 300 mm; Angle OAB 30°, AB = 1200 mm; BC = 450 mm and CD = 450 mm. For the given configuration, Determine: 1. velocities of sliding at B and D, 2. Angular velocity of CD, 3. linear acceleration of D, and 4. angular acceleration of CD. 	L3	10
	c			
		OR		
Q.04	a	Determine the required input torque T1 for static equilibrium of the mechanism shown in Figure. Torques T2 and T3 are pure torques, having magnitudes of 10N.m • m and 7 Nm, respectively.	L3	10

				
	b	A four-link mechanism with the following dimensions is acted upon by a force 80 N, /_150 ^{o} on the link DC, AD = 500mm, AB = 400mm, BC = 1000mm, DC = 750mm ,DE=350mm. Determine the input torque T on the link AB for the static equilibrium of the mechanism for the given configuration.  *Figure 10*	L3	10
	c			
		Module-3		
Q. 05	a	Derive an expression to determine the length of path of contact between two spur gears of different size.	L2	10
	b	A pinion having 20 teeth engages with an internal gear having 80 teeth. If the gears have involute profiled teeth with 20 ^{o} pressure angle, module of 10mm and addendum of 10mm, find the path of contact, arc of contact and the contact ratio.	L3	10
	c			
		OR		
Q. 06	a	An epicyclic gear train is arranged as shown in fig. the internal gear D has 90 teeth and the sun gear A has 40 teeth. The two planet gears B&C are identical and they are attached to an arm as shown. How many revolutions does the arm make. (i) When A makes one revolution clockwise and D makes half a revolution counter clockwise ii) when A makes one revolution clockwise and D remains stationary. 	L3	10
	b	In an epicyclic gear of the ‘sun and planet’ type shown in Fig. the pitch circle diameter of the internally toothed ring is to be 224 mm and the module 4 mm. When the ring D is stationary, the spider A, which carries three planet wheels C of equal size, is to make one revolution in the same sense as the	L3	10

<table>
<tr><td></td><td></td><td>sun wheel B for every five revolutions of the driving spindle carrying the sun wheel B. Determine suitable numbers of teeth for all the wheels.
 
</td><td></td><td></td></tr>
<tr><td></td><td>c</td><td></td><td></td><td></td></tr>
<tr><td colspan="2"></td><td>Module-4</td><td></td><td></td></tr>
<tr><td>Q. 07</td><td>a</td><td>A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg,400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions.</td><td>L3</td><td>10</td></tr>
<tr><td></td><td>b</td><td>Four masses A, B, C and D as shown below are to be completely balanced.
<table>
<tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td></tr>
<tr><td>Mass(Kg)</td><td>-</td><td>30</td><td>50</td><td>40</td></tr>
<tr><td>Radius(mm)</td><td>180</td><td>240</td><td>120</td><td>150</td></tr>
</table>
The planes containing masses B and C are 300 mm apart. The angle between planes containing B and C is 90°. B and C make angles of 210° and 120° respectively with D in the same sense. Find :
1. The magnitude and the angular position of mass A ; and
2. The position of planes A and D</td><td>L3</td><td>10</td></tr>
<tr><td></td><td>c</td><td></td><td></td><td></td></tr>
<tr><td colspan="2"></td><td>OR</td><td></td><td></td></tr>
<tr><td>Q. 08</td><td>a</td><td>Derive the following expressions, for an uncoupled two cylinder locomotive engine:(a) Variation is tractive force; (b) Swaying couple; and (c) Hammer blow.</td><td>L2</td><td>10</td></tr>
<tr><td></td><td>b</td><td>A five cylinder in-line engine running at 750 r.p.m. has successive cranks 144° apart, the distance between the cylinders centre lines being 375 mm. The piston stroke is 225 mm and the ratio of the connecting rod to the crank is 4. Examine the engine for balance of primary and secondary forces and couples. Find the maximum values of these and the position of the central crank at which these maximum values occur. The reciprocating mass for each cylinderis 15 kg.</td><td>L3</td><td>10</td></tr>
<tr><td></td><td>c</td><td></td><td>L1</td><td></td></tr>
<tr><td colspan="2"></td><td>Module-5</td><td></td><td></td></tr>
<tr><td>Q. 09</td><td>a</td><td>The arms of Hartnell governor are of equal length. When the sleeve is in the mid-position, the masses rotate in a circle of diameter 200 mm (the arms are vertical in the mid-position) Neglecting friction, the equilibrium speed for this position is 300 rpm Maximum variation of speed, taking friction into account, is to ± 5% of the mid-position speed for a maximum sleeve movement of 25mm. The sleeve mass 5 kg and the friction at the sleeve is 30N</td><td>L3</td><td>10</td></tr>
<tr><td></td><td>b</td><td>Explain about the Controlling force diagram and stability for porter governor</td><td>L1</td><td>10</td></tr>
<tr><td></td><td>c</td><td></td><td></td><td></td></tr>
<tr><td colspan="2"></td><td>OR</td><td></td><td></td></tr>
<tr><td>Q. 10</td><td>a</td><td>Explain the effect of Gyroscope couple on a Aeroplane</td><td>L2</td><td>10</td></tr>
<tr><td></td><td>b</td><td>The Turbine rotor of a ship has 2.4 tones and rotates at 1750 rpm clockwise The radius of gyration of the rotor is 300mm. determine the gyroscopic couple and its effect when</td><td>L3</td><td>10</td></tr>
</table>

		i. The ship turns right at an radius of 250 m with a speed of 22kmph ii. The ship pitches with the bow rising at an angular velocity of 0.85 rad/s and iii. The ship rolls at an angular velocity of 0.15 rad/s		
	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.