

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025 Theory of Machines

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module. 2. M : Marks, L: Bloom's level, C: Course outcomes.

		Module – 1	Μ	L	С
Q.1	a.	Define : (i) Kinematic link (ii) Kinematic pair (iii) Kinematic chain (iv) Mechanism (v) Machine.	10	L1	COI
	b.	Briefly explain the following inversions :	10	L1	CO
	D.	(i) Beam engine	10	171	
		(i) Watt's straight line mechanism			
		OR			
Q.2	a.	In a slider crank mechanism, the crank OB = 30 mm and connecting rod BC = 120 mm. The crank rotates at a uniform speed of 300 rpm clockwise. For the crank position as shown in Fig. Q2 (a) ; find (i) Velocity of Piston C and angular velocity of connecting rod BC (ii) Acceleeration of piston C and angular acceleration of connecting rod BC.	10	L.3	СО
		$\begin{array}{c} & & & \\ & & & & \\ & & & \\ & &$			
	b.	If the crank and connecting rod are 150 mm and 600 mm long respectively and the crank rotates at a uniform speed of 100 rpm closckwise; determine the angular velocity and angular acceleration of connecting rod and velocity of the piston by using Raven's approach. The angle which the crank makes with the inner dead center is 30° .	10	L3	CO
	-d	Module – 2			1
Q.3	a.	 With a neat sketch, explain the following : (i) Equillibrium of Three force members (ii) Equillibrium of Four force members. 	10	L1	CO
	b.	For a slider crank mechanism as shown in Fig. Q3 (b), the force applied to the piston is 1000 N when the crank is at 60° from IDC. Given AB = 100 mm and BC = 300 mm. Calculate the driving torque T_2 .	10	1.3	
		Fig. Q3 (b)			
		$\Gamma Ig. QS(0)$	1	1	

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				OR	10	L1	C	02
.4	a.	Exp	olain :					
			(i)	Dynamic force analysis.			4	
			(ii)	D'Alembert's principle. In machine punches 38 mm holes in 32 mm thick plate requires and punches one hole in every 10 sec. The	10	L3	C	02
	b.	A	punchin	ig machine punches 38 min holes in 52 min every 10 sec. The				
		71	N-m/mr	ing machine punches 38 min noises in 52 min every 10 sec. The m^2 of sheared area and punches one hole in every 10 sec. The ed is of the flywheel given is 25 m/sec. The punch has a stroke of				
		me	an spee	ed is of the flywheel given is 25 m/see. The para				
		10	a mm I	Find '				
		(i)	Pow	er required to drive the machine.				
		(ii) Mas	s of the flywheel, if total fluctuation of speed is not to exceed 3%.				
			2	Module – 3	10	L	1 (CO3
Q.5	a.	De	efine the	e following gear terminologies :				
Q.5			(i)	Pitch circle.				
			(ii)	Pitch circle diameter.				
			(iii)	Addendum				
			(iv)	Dedendum				
				Module.	10	I	3	CO3
	b	Δ	ninion	the program howing so the first the brothe of the				
	U							
		g	ddondu	m. Find the length of path of contact and length of arc of contact.				
		a	adendu	OR	1 1		.2	CO3
		F		with usual notations; an expression for velocity ratio of compound	1 1		14	005
Q.6	a	• L	Jerive v		1 1		13	CO3
	_	2	ear trai	ns. Dicyclic gear train, an arm carries two gears A and B having 36 and	d 1		Lo	0.05
	1.). 1	n an Hr		PI			
	L) . 1	II all LF	icyclic ged itali, it the arm rotates at 150 rpm in anticlockwise				
		4	15 teeth	h respectively. If the arm lotates at root as shown in Fig. O6 (b));			
			15 teeth direction	n about centre of gear A which is fixed as shown in Fig. Q6 (b)); S			
			15 teeth direction	n about centre of gear A which is fixed as shown in Fig. Q6 (b)); S			
		c t	15 teeth direction then det 300 rpr	h respectively. If the arm rotates at respectively. If the arm rotates at respectively. If the arm rotates at respect as shown in Fig. Q6 (b) n about centre of gear A which is fixed as shown in Fig. Q6 (b) termine speed of gear B. If the gear A instead of being fixed make m in clockwise direction, what will be the speed of gear B? Use); S			
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		c t	15 teeth direction then det 300 rpr	h respectively. If the arm founces at first as shown in Fig. Q6 (b) n about centre of gear A which is fixed as shown in Fig. Q6 (b) termine speed of gear B. If the gear A instead of being fixed make n in clockwise direction, what will be the speed of gear B? Use method.); S			
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Q.			45 teeth direction then det 300 rpr Tabular A shaf length B and betwe shaft as we	h respectively. If the anii formes at the shown in Fig. Q6 (b) termine speed of gear B. If the gear A instead of being fixed make in in clockwise direction, what will be the speed of gear B? Use method. Fig. Q6 (b) Module – 4 ft carries 4 masses A, B, C, D in parallel planes in this order along . The masses at B and C are 18 kg and 12.5 kg respectively. Each C has an eccentricity of 60 mm. The masses at A and D have tricity of 80 mm. The angle between B and C is 100° and in between A is 190°, both being measured in same direction. The axial distar- teen A and B is 100 mm and in between B and C is 200 mm. For to be in complete balance, determine magnitude of masses at A and I as the angular position of mass at D.	its of an een hce the d D			
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Q.		a.	45 teeth direction then det 300 rpr Tabular Tabular A shaf length B and eccent B and betwe shaft as we A fou rotation	h respectively. If the arm founces at the as shown in Fig. Q6 (b) termine speed of gear A which is fixed as shown in Fig. Q6 (b) termine speed of gear B. If the gear A instead of being fixed make in clockwise direction, what will be the speed of gear B? Use method. Fig. Q6 (b) Module – 4 ft carries 4 masses A, B, C, D in parallel planes in this order along . The masses at B and C are 18 kg and 12.5 kg respectively. Each C has an eccentricity of 60 mm. The masses at A and D have tricity of 80 mm. The angle between B and C is 100° and in between A is 190°, both being measured in same direction. The axial distar- tion the in complete balance, determine magnitude of masses at A and El as the angular position of mass at D. ar cylinder vertical engine has cranks 150 mm long. The planes on of the 1 st , 2 nd and 4 th cranks are 400 mm, 200 mm and 200 r ctively from 3 rd crank and their reciprocating masses are 50 kg, 60	its of an een hce d D s of 3 rd	10		
Q.		a.	45 teeth direction then det 300 rpr Tabular Tabular A shaft length B and eccent B and betwe shaft as we A fou rotation respendent	h respectively. If the ann rotates at a shown in Fig. Q6 (b) termine speed of gear A which is fixed as shown in Fig. Q6 (b) termine speed of gear B. If the gear A instead of being fixed make in in clockwise direction, what will be the speed of gear B? Use method. A Fig. Q6 (b) Module - 4 ft carries 4 masses A, B, C, D in parallel planes in this order along . The masses at B and C are 18 kg and 12.5 kg respectively. Each C has an eccentricity of 60 mm. The masses at A and D have tricity of 80 mm. The angle between B and C is 100° and in betwee A is 190°, both being measured in same direction. The axial distar the masses at A and B is 100 mm and in between B and C is 200 mm. For to be in complete balance, determine magnitude of masses at A and at a sthe angular position of mass at D. ar cylinder vertical engine has cranks 150 mm long. The planes	its of an een hce d D s of 3 rd	10		

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		OR			
Q.8	a.	Define the following terminologies :	10	L1	CO4
		(i) Sensitiveness			
		(ii) Stability			
		(iii) Hunting			
		(iv) Effort			
		(v) Power.			
	b.	A Porter governor has equal arms each of 250 mm long and pivoted on the	10	L3	CO ²
		axis of rotation. Each flyball has a mass of 5 kg and the mass of central			
		sleeve is 15 kg. The radius of rotation of the flyball is 150 mm when the			
		governor begins to lift and 200 mm when the governor is at maximum			
		speed. Find the minimum, maximum speeds and the range of speed of the			
		governor.			
		Module – 5			
Q.9	a.	Define the following types of vibrations :	10	L1	COS
		(i) Free vibration.			
		(ii) Forced vibration			
		(iii) Damped vibration.			
		(iv) Undamped vibration			
		(v) Longitudinal vibration.			
	b.	Determine the natural frequency of the spring mass pulley system as shown	10	L3	CO
		in Fig. Q9 (b).			
		n n n n k			
Q.10		Fig. Q9 (b) OR Explain the following : a. Rotating unbalance. b. Reciproceeting unbalance.	20	1.2	CO5
		b. Reciprocating unbalance.c. Vibration isolation			
		c. Vibration isolationd. Critical speed.			
		a. Childai speed.	L		

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