CBCS SCHEME

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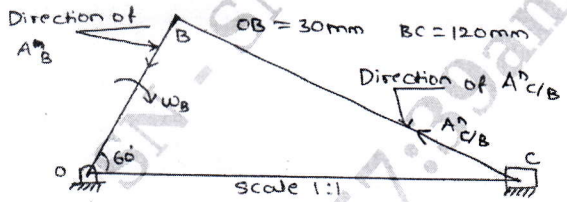
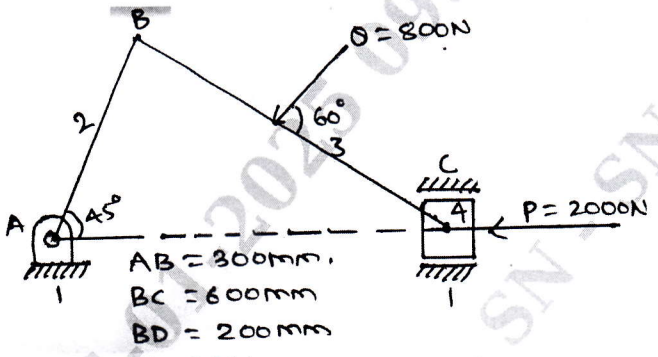
BAU401

Fourth 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	M	L	C
Q.1	a.	Explain Crank and slotted lever mechanism with a neat sketch.	10	L2	CO1
	b.	Explain the following terms with example : i) Kinematic pair ii) Kinematic chain iii) Mechanism iv) Degree of freedom v) Structure.	10	L2	CO1
		OR			
Q.2	a.	Discuss about Linear and Angular Acceleration .	4	L2	CO3
	b.	In a slider crank mechanism, the crank OB = 30mm and the connecting rod BC = 120mm. The crank rotates at a uniform speed of 300 rpm clockwise. For the crank position shown in fig. Q2(b). Find i) velocity of piston C and angular velocity of connecting rod BC ii) Acceleration of piston C and angular acceleration of connecting rod BC.  Fig. Q2(b)	16	L1	CO1
		Module – 2			
Q.3	a.	Deduce the relation between length of arc of contact , path of contact and contact ratio of gear mechanism.	10	L4	CO1
	b.	An epicyclic gear train is constructed as follows : A fixed annular wheel a and a smaller concentric wheel B are connected by a compound wheel A_1 - B. A_1 gearing A. B_1 gearing with B. The compound wheel revolves on a stud which is carried around on arm which revolved about the axis A and B. 'A' has 130 teeth , B = 20 teeth , B_1 = 80 teeth , Pitch of A and A_1 being twice that of pitch of 'B' and B_1. How many revolution B will make for one revolution of arm. (Tabular method).	10	L4	CO1
		OR			
Q.4		Draw to full size the profile of a cam which will give a lift of 38mm to a follower carrying a roller of 25mm diameter. The axis of the follower is off – set by 18mm to the right of the axis of cam. Ascent of the follower takes place with SHM in 0.05 second followed by a period of rest 0.0125 second. The follower by then descent with UARM during 0.125 second. The acceleration being 3/5 times retardation. The cam rotates in clockwise direction at a constant speed of 240 rpm and the base circle radius is 50mm.	20	L3	CO4

		Module – 3			
Q.5	**a.**	With a neat sketches, discuss the static equilibrium of the following : i) Two force members ii) Two forces and Torque members.	**4**	**L2**	**CO5**
	b.	Resolve the various forces on the links and couple T2 shown in the fig. Q5(b).  Fig. Q5(b)	**16**	**L4**	**CO5**
		OR			
Q.6	**a.**	Explain inertia forces on a engine mechanism (slider crank mechanism).	**10**	**L2**	**CO5**
	b.	A vertical double acting steam engine has a cylinder 300mm diameter and 450mm stroke and runs at 200 rpm. The reciprocating parts has a mass of 225kg and the piston rod is 50mm diameter. The connecting rod is 1.2m long. When the crank has turned through 125° from the top dead centre. The steam pressure above the piston is 30kN/m^2 and below the piston is 1.5kN/m^2. Calculate the effective turning moment on the crank shaft.	**10**	**L3**	**CO5**
		Module – 4			
Q.7	**a.**	Explain Turning moment diagram for 4 stroke IC engine.	**6**	**L2**	**CO7**
	b.	Outline a relation between E , e_{max} and K_s or relation between e_{max} , K_s and I.	**6**	**L2**	**CO7**
	c.	A double acting steam engine develops 350kW at 120 rpm. It is fitted with a flywheel of radius of gyration = 2.5m. The coefficient of fluctuation of energy = 0.1. the speed of flywheel is not to deviate more than 0.5% from the mean speed. Find the mass of the flywheel.	**8**	**L1**	**CO7**
		OR			
Q.8	**a.**	Define and take part in the following terms : i) Sensitiveness ii) Hunting iii) Stability iv) Governor power v) Isochronous Governor.	**10**	**L1**	**CO6**
	b.	Each arm of a porter governor is 300mm long and is pivoted on the axis of the governor. Each ball has a mass of 6kg and the mass of sleeve is 18kg. The radius of rotation of ball is 200mm when the governor begins to lift and 250mm when the speed is maximum. Determine the maximum and minimum speed and the range of speed of governor.	**10**	**L3**	**CO6**

		Module – 5			
Q.9	**a.**	Explain the types of friction and state the laws of friction.	**10**	**L2**	**CO5**
	b.	The thrust on the propeller shaft of a marine engine is taken by 8 collars whose external and internal diameters are 650 mm and 400mm respectively. The maximum thrust pressure is 0.5MPa. The coefficient of friction between the shaft and collars is 0.04. If the shaft rotates at 120rpm evaluate a) assuming uniform pressure : i) total trust on the collars ii) power absorbed by friction at the bearing b) Assuming uniform wear : i) Total thrust on the collars ii) power absorbed by friction at the bearing.	**10**	**L4**	**CO5**
		OR			
Q.10	**a.**	Derive an expression for ratio of belt tensions.	**10**	**L3**	**CO7**
	b.	A line shaft is driven by an electric motor through an open belt drive. The speed of the motor is 1500 rpm and the line shaft should rotate at 600 rpm. The maximum linear speed at which the belt should run is 1200m/min. Determine the diameters of the pulleys when i) Thickness of belt is neglected. ii) Thickness of belt is 12mm. iii) 5% total slip is taken by considering thickness of belt.	**10**	**L3**	**CO7**

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