

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

USN

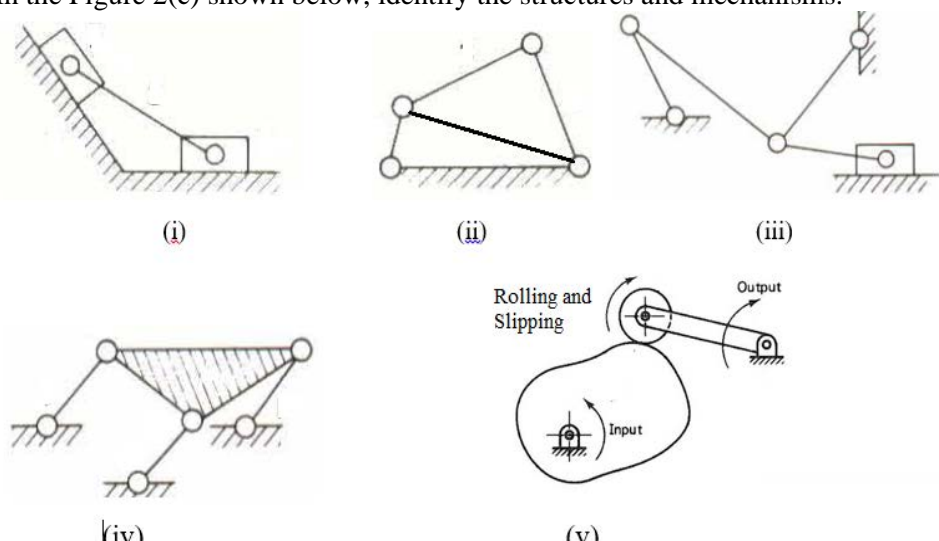
--	--	--	--	--	--	--	--	--	--

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	List different types of 'kinematic pair' giving an example for each.	L1	4
	b	Draw neat diagram of 'Peaucellier's mechanism'? Explain its Constructional features, working and application of this mechanism.	L2	8
	c	Power has to be transmitted between two shafts whose axes are having parallel misalignment. With a neat sketch explain the mechanism used for this application.	L3	8
OR				
Q.02	a	Define complete and incomplete constrained motion. Illustrate answer with neat sketches.	L1	3
	b	Sketch and describe the working mechanism used for movement of the tool post of a shaper machine. Also, explain the reason for using this mechanism.	L2	7
	c	In the Figure 2(c) shown below, identify the structures and mechanisms. 	L4	10
Module-2				
Q. 03	a	Explain Alembert's principle.	L1	6
	b	A conical pivot supports a load of 20kN, the cone angle is 120 and the intensity of normal pressure is not to exceed 0.3 MPa. The external diameter is twice the internal diameter. Find the inner and outer radii of the bearing surface. If the shaft rotates at 200 rpm, and the coefficient of friction is 0.1, calculate the power absorbed in friction. Assume uniform pressure.	L3	6
	c	Find the power transmitted by a flat belt running over a pulley of 600 mm diameter at 200 rpm. The coefficient of friction between the belt and the pulley is	L3	8

		0.25, angle of lap 160° and maximum tension in the belt is 2500 N.		
OR				
Q.04	a	List atleast two applications for each where, (i) Higher friction is preferred, (ii) Lesser friction is preferred	L2	4
	b	Explain (i) Slip, (ii) Creep and (iii) centrifugal tension in belt drive.	L2	4
	b	Two pulleys one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart. A Flat belt drive is used to transmit the power. If the maximum tension in the belt is 1 KN and coefficient of friction between belt and pulley is 0.25. Either an open belt drive or a cross belt drive could be used. Compare the power transmitted in each case and suggest the best option. The larger pulley rotates at 200 rpm.	L4	12
Module-3				
Q. 05	a	Balancing of rotating parts necessary for high speed engines. Why?	L4	4
	b	Four masses A, B, C and D are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45° , 75° and 135° . Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m. (Either solve by Analytical Or Graphical Method)	L3	8
	c	A single cylinder reciprocating engine has speed 240 r.p.m., stroke 300 mm, mass of reciprocating parts 50 kg, mass of revolving parts at 150 mm radius 37 kg. If two third of the reciprocating parts and all the revolving parts are to be balanced, find : (i). The balance mass required at a radius of 400 mm, and (ii). The residual unbalanced force when the crank has rotated 60° from top dead centre.	L3	8
OR				
Q. 06	a	The primary unbalanced force due to reciprocating masses is maximum twice in one revolution of the crank. Prove.	L3	6
	b	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	14
Module-4				
Q. 07	a	Define and explain the following terms relating to governors : 1. Stability, 2. Sensitiveness, 3. Isochronism, and 4. Hunting.	L1	4
	b	What do you understand by gyroscopic couple? Derive the equation for its magnitude.	L3	6
	c	A Porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the minimum and maximum speeds and range of speed of the governor.	L3	10
OR				
Q. 08	a	Discuss the controlling force and stability of a governor and show that the stability of a governor depends on the slope of the curve connecting the controlling force (F_C) and radius of rotation (r) and the value (F_C/r).	L2	6
	b	The mass of the turbine rotor of a ship is 20 tonnes and has a radius of gyration of 0.60 m. Its speed is 2000 r.p.m. The ship pitches 6° above and 6° below the horizontal position. A complete oscillation takes 30 seconds and the motion is simple harmonic. Determine the following: (i). Maximum gyroscopic couple, (ii). Maximum angular acceleration of the ship during pitching, and (iii). The direction in which the bow will tend to turn when rising, if the rotation of the rotor is clockwise when looking from the left.	L3	14
Module-5				

Q. 09	a	List atleast five applications where the cam and follower mechanism.	L4	5
	b	Why a roller follower is preferred over a knife edge follower?	L2	3
	c	Design a cam to raise a valve with simple harmonic motion through 50 mm in 1/3 of a revolution, keep it fully raised through 1/12 revolution and to lower it with uniform acceleration and deceleration in 1/6 revolution. The valve remains closed during the rest of the revolution. The diameter of the roller is 20 mm and the minimum radius of the cam is 25 mm.	L3	12
OR				
Q. 10	a	Draw the displacement, velocity and acceleration diagrams for a follower when it moves with uniform velocity. How is large inertia forces generated at the beginning and end of each stroke taken care?	L4	4
	b	A cam rotating clockwise at a uniform speed of 200 r.p.m. is required to move an offset knife edge follower with a uniform and equal acceleration and retardation on both the outward and return strokes. The angle of ascent, the angle of dwell (between ascent and descent) and the angle of descent is 120°, 60° and 90° respectively. The follower dwells for the rest of cam rotation. The least radius of the cam is 50 mm, the lift of the follower is 25 mm. The line of stroke of the follower is offset by 20 mm from the axis of the cam. Draw the cam profile.	L3	16

*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.