Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Third Semester

Agricultural Engineering

ME3491 – Theory of Machines

(Common to Fourth Semester Mechanical Engineering)

Regulations - 2021

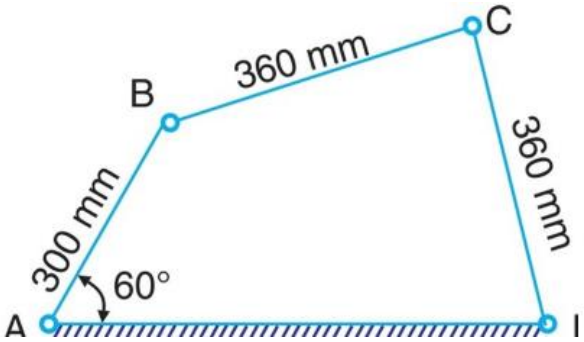
Duration: 3 Hrs *Maximum: 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q. No	*Questions*	*BTL*	*CO*	*Marks*
1.	Name any two inversions of the four-bar mechanism.	L1	1	2
2.	What are the different types of cams?	L2	1	2
3.	State the fundamental Law of Toothed Gearing.	L1	2	2
4.	Describe compound gear train.	L2	2	2
5.	Define laws of friction.	L1	3	2
6.	State the functional difference between a clutch and a brake.	L1	3	2
7.	Compare the Inertia force & Inertia torque.	L2	4	2
8.	Outline the D'Alembert's principle.	L1	4	2
9.	Write the different types of balancing?	L2	5	2
10.	How will you classify vibration?	L2	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a	In a pin jointed four bar mechanism, as shown in Fig., AB = 300 mm, BC =CD=360 mm, and AD = 600 mm. The angle BAD = 60°. The crank AB rotates uniformly at 100 r.p.m. Develop all the instantaneous centers and find the angular velocity of the link BC.	L6	1	16



Or

	b	A cam, with a minimum radius of 50 mm, rotating clockwise at a uniform speed, is required to give a knife edge follower the motion as described below: 1. To move outwards through 40 mm during 100° rotation of the cam 2. To dwell for next 80° 3. To return to its starting position during next 90°, and 4. To dwell for the rest period of a revolution i.e. 90°. Draw the profile of the cam (i) when the line of stroke of the follower passes through the Centre of the cam shaft, and (ii) when the line of stroke of the follower is off-set by 15 mm. The displacement of the follower is to take place with uniform acceleration and uniform retardation. Determine the maximum velocity and acceleration of the follower when the cam shaft rotates at 900 r.p.m. Draw the displacement, velocity and acceleration diagrams for one complete revolution of the cam.	L6	1	16
12.	a	Describe the procedure of the law of tooth gearing.	L2	2	16
		Or			
	b	Explain the various types of gear trains with a neat sketch.	L2	2	16
13.	a	An open belt running over two pulleys 240 mm and 600 mm diameter connects two parallel shafts 3 m apart and transmit 4 kW from the smaller pulley that rotates at 300 rpm. Coefficient friction between the belt and the pulley is 0.3 and the safe working tension 10N per mm width. Determine: (i) Minimum width of the belt (ii) Initial belt tension and (iii) Length of the belt required	L3	3	16
		Or			
	b	A single plate clutch, with both sides effective, has outer and inner diameters 300 mm and 200 mm respectively. The maximum intensity of pressure at any point in the contact surface is not to exceed 0.1 N/mm^2. If the coefficient of friction is 0.3, determine the power transmitted by a clutch at a speed 2500 r.p.m.	L3	3	16
14.	a	The crank and connecting rod of a steam engine are 0.3 m and 1.5 m in length. The crank rotates at 180 r.p.m. clockwise. Determine the velocity and acceleration of the piston when the crank is at 40 degrees from the inner dead centre position. Also determine the position of the crank for zero acceleration of the piston.	L3	4	16
		Or			
	b	The length of crank and connecting rod of a horizontal engineer are 200 mm and 1 m respectively. The crank is rotating at 400 rpm. When the crank has turned through 30° from the inner dead centre, the difference of pressure between cover and piston rod is 0.4 Nmm^2. If the mass of the reciprocating parts is 100 kg and cylinder bore is 0.4 meters, then calculate; i) Inertia force (ii) Force on piston (iii) Piston effort (iv) Thrust on the sides of the cylinder walls (v) Thrust in the connecting rod (vi) Crank effort.	L3	4	16

15.	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.	L3	5	16
		Or			
	b	A steel shaft 1.5m long is 95mm diameter for the first 0.6m of its length, 60mm in diameter for the next 0.5m of the length and 50mm in diameter for the remaining 0.4m of its length. The shaft carries two flywheels at two ends, the first having a mass of 900kg and 0.85m radius of gyration located at the 95mm diameter end and the second having a mass of 700kg and 0.55m radius of gyration located at the other end. Determine the location of the node and the natural frequency of free torsional vibration of the system. The modulus of rigidity of shaft material may be taken as 80GN/m^2.	L3	5	16