

THE KAVERY ENGINEERING COLLEGE*(An Autonomous Institution)***B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025***Third Semester**Agricultural Engineering***UMETL24305 - Mechanics of Machines***Regulations - 2024**Duration : 3 Hrs**Maximum : 100 Marks***PART - A (ANSWER ALL QUESTIONS) (Marks 10*2=20)**

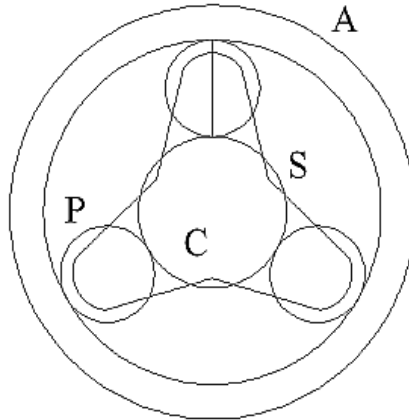
<i>Q.No</i>	<i>Questions</i>	<i>BTL</i>	<i>CO</i>	<i>Marks</i>
1.	Under what conditions kinematic chain become a mechanism?	L2	1	2
2.	Why is the roller follower preferred over a knife-edged follower?	L2	1	2
3.	What do you understand by the term 'interference' as applied to gears?	L2	2	2
4.	Where is the epicyclic gear train used?	L2	2	2
5.	Write the types of friction.	L1	3	2
6.	List out the belt materials?	L1	3	2
7.	State D'Alembert's principle.	L1	4	2
8.	Define piston effort and crank effort.	L2	4	2
9.	Give the general equation of forced vibration of a mechanical system.	L2	5	2
10.	State the conditions for dynamic and static balancing.	L2	5	2

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

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
11.	a In a four-bar chain ABCD, AD is fixed and is 15 cm long. The crank AB is 4 cm long and rotates at 120 rpm clockwise, while the link CD (whose length is 8 cm) oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60°.	L3	1	16
	Or			
	b A cam is giving the following motion to a cam gives the following motion to a knife-edged Follower: 1. Outside during 60° of cam rotation: 2. Dwell for the next 30° of cam rotation: 3. Return stroke during next 60° of cam rotation, and 4. Dwell for the remaining 210° of cam Rotation. The stroke of the follower is 40 mm, and the minimum radius of the cam is 50 mm. The Follower moves with uniform velocity during both the outstroke and return strokes. Draw the Profile of the cam when (a) The axis of the follower passes through the axis of the cam shaft, and (b) The axis of the follower is offset by 20 mm from the axis.	L3	1	16
12.	a Calculate: Length of path of contact, Arc of contact, and the contact ratio, when a pinion having 23 teeth drives a gear having 57 teeth. The profile of the gears is involuted with a pressure angle 20°, a module of 8 mm, and an addendum equal to one module. Create the gear.	L4	2	16

Or

- b An epicyclic gear train for an electric motor is shown in the figure. The wheel S has 15 teeth and is fixed to the motor shaft, rotating at 1450 rpm. Planet P has 45 teeth, gears with fixed annular A and rotates on a spindle carried by an arm that is fixed to the output shaft. The planet P also gears with the sun when S. Find the speed of output shaft. If the motor is transmitting 2 KW find the torque required to fix the annular.



13. a i A shaft that rotates at a constant speed of 160 rpm is connected by belting to a parallel shaft 720 mm apart, which must run at 60,80, and 100 rpm. The smallest pulley on the driving shaft is 40mm in radius. Determine the remaining radii of the two stepped pulleys for a crossed belt and an open belt. Neglect the belt thickness and slip.

- ii Why is the cross belt used instead of an open belt? Justify with proper examples.

Or

- b i Derive an expression for braking torque on the drum of a simple band brake.
- ii Deduce the expression for the friction moment of a collar thrust bearing, stating clearly the assumption made.

14. a A vertical petrol engine 150 mm in diameter and 200 mm stroke has a connecting rod 350 mm long. The mass of the piston is 1.6 kg, and the engine speed is 1800 rpm on the expansion stroke with crank angle 30° from top dead Centre, the gas pressure is 750 KN/m^2 . Determine the net thrust on the piston.

Or

- b The length of the crank and connecting rod of a horizontal reciprocating engine are 200 mm and 1m, respectively. The crank is rotating at 400 rpm. when the crank has turned 30° from the inner dead center, the difference of pressure between the cover end and piston end is 0.4 N/mm^2 . If the mass of the reciprocating parts is 100 kg and the cylinder bore is 0.4 m, then calculate: (i) inertia force, (ii) force on piston, (iii) piston effort, (iv) thrust on the sides of cylinder walls, (v) thrust in the connecting rod, (vi) crank effort.

15. a A shaft of diameter 10 mm carries at its center a mass of 12 kg. It is supported by two short bearings, the center distance of which is 400 mm. Find the whirling speed: (a) Neglecting the mass of the shaft and (b) considering the mass of the shaft. The density of shaft material is 7500 kg/m^3 . Take $E = 200 \text{ GN/m}^2$.

Or

- b A machine of mass 75 kg is mounted on springs of stiffness 12×10^5 N/m and with an assumed damping factor of 0.2. A piston within the machine of mass 2 kg has a reciprocating motion with a stroke of 80 mm and a speed of 3000 cycles/min. Assuming the motion to be simple harmonic, find:
- L4 5 16
- (i) the amplitude of motion of the machine,
 - (ii) its phase angle with respect to the exciting force,
 - (iii) the force transmitted to the foundation,
 - (iv) the phase angle of the transmitted force with respect to the exciting force,
 - (v) The phase lag of the transmitted force with respect to the applied force.