

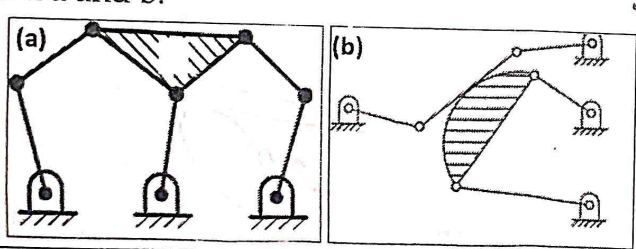
B. Tech.
Year: 2nd Year Semester: 3rd (Odd Sem)
MINOR TEST (EXAMINATION): 2025

Theory of Machines

Time: 2 Hr

Max. Marks: 20

NOTE: Attempt All questions.

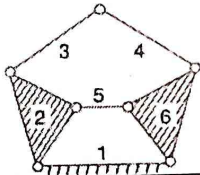
Q1.	Attempt any Two parts of the following.	Marks	CO	BL	PO	PI Code
(a)	Define the terms: Mechanism, Kinematic Link, Kinematic Pair, and Kinematic Chain.	4	1	1	1	1.1
(b)	Explain the effect of the gyroscopic couple on the reaction of the four wheels of a vehicle negotiating right turn looking from the rear.	4	3	2	2	2.2
(c)	Draw profile of radial cam operating with roller type having lift 45 mm. The outstroke of follower is S.H.M. for 160° of cam rotation followed by a dwell of 40°. The follower returns with uniform velocity, for next 130° rotation of cam, again followed by dwell period. The cam rotates at 100 rpm and base circle diameter is 50 mm and roller diameter is 10 mm.	4	2	3	3	3.1
Q2.	Attempt any Two parts of the following.					
(a)	Explain type of constrained motion and classify the kinematic pair according to the type of contact between the elements.	3	1	1	1	1.2
(b)	Find the degree of Freedom of given Planar Mechanism shown in a and b. 	3	1	3	2	2.1
(c)	What are the different Inversions of a four bar mechanism? Give examples of their applications.	3	1	2	3	3.2
Q3.	Attempt any Two parts of the following.					
(a)	Briefly explain the different types of cams and followers.	3	2	1	1	1.3
(b)	What do you understand by gyroscopic couple? Derive a formula for its magnitude.	3	3	3	2	2.3
(c)	An aeroplane flying at 240 km/h turns towards the left and completes a quarter circle of 60 m radius. The mass of the rotary engine and the propeller of the plane is 450 kg with a radius of gyration of 320 mm. The engine speed is 2000 rpm clockwise when viewed from the rear. Determine the gyroscopic couple on the aircraft and state its effect.	3	3	4	2,4	2.4

B. Tech.
Year: II Semester: III
Even Semester 2025-2026
Theory of Machines

Max Marks: 50

Time: 3 Hr.

Note: Attempt All questions.

Q1	Attempt any five parts of the following.	Marks	CO	BL	PO	PI Code
a) ✓	What is kinematic mechanism and when it is called structure?	2	1	1,2	1,2	1.3.1
b)	Name the appropriate mechanism used for following applications: (i) Converting rotary motion into reciprocating motion (ii) Connecting misaligned shafts Lifting water from well (iii) Motion of locomotive wheel (iv) Shaper machine	2	1	2,3	1,2	2.1.1
c)	If a block slides outward on a link at a uniform rate of 30 m/s, while the link is rotating at a constant angular velocity of 50 rad/s counter clockwise, then find the Coriolis component of acceleration.	2	1	3	1,2	1.4.1
d)	Write the classification of follower according to as per (a) shape and (b) motion.	2	2	1,2	1	1.4.1
e) ✓	Explain via examples how to find all I-centres for a four bar mechanism using Kennedy's theorem.	2	1	3,4	1,2	1.4.1
f) ✓	Draw the displacement diagrams for a follower when it moves with simple harmonic motion.	2	2	3,4	2	2.1.1
g) ✓	What is the significance of degrees of freedom of a kinematic chain? Determine the mobility (degrees of freedom) of the below shown mechanism. <div style="text-align: center;">  </div>	2	1	2,3	2	2.1.1
Q2.	Attempt any two parts of the following.	5	4	2,3	1,2	1.4.1
a) ✓	Explain briefly the concept of Interference in gears.	5	4	3,4	1,2	1.4.1
b) ✓	State and prove the law of gearing. Show that involute profile satisfies the conditions for correct gearing.	5	4	3,4	1,2	1.4.1
c)	Two gear wheels mesh externally and are to give a velocity ratio of 3 to 1. The teeth are of involute form; module = 6 mm, addendum = one module, pressure angle = 20°. The pinion rotates at 90 r.p.m. Determine: a) The number of teeth on the pinion to avoid interference on it and the corresponding number of teeth on the wheel, b) The length of path and arc of contact, c) The number of pairs of teeth in contact, and d) (d) The maximum velocity of sliding.	5	4	3,4	1,2	1.4.1
Q3.	Attempt any two parts of the following.	5	4	2,4	2	2.1.1
a)	How epicyclical gear train differ from other gear train	5	4	2,4	2	2.1.1
b)	Why the involute gears are more commonly used in actual practice, compared to cycloidal gears.	5	4	3,4	1,2	2.1.1
c) ✓	In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 300 r.p.m. in the clockwise direction, what will be the speed of the gear B.	5	5	3,4	1,2	1.4.1
Q4.	Attempt any two parts of the following.	5	5	3,4	1,2	1.4.1
a)	Derive an expression with neat sketch for (a) velocity, and (b) acceleration for dynamic of single slider crank chain mechanism.	5	5	3,4	1,2	1.4.1

b)	Explain the terms fluctuation of energy, fluctuation of speed as applied to flywheels. And also define the terms 'coefficient of fluctuation of energy' and 'coefficient of fluctuation of speed', in the case of flywheels.	5	5	2	2	2.1.1
c)	A shaft fitted with a flywheel rotates at 250 r.p.m. and drives a machine. The torque of machine varies in a cyclic manner over a period of 3 revolutions. The torque rises from 750 N-m to 3000 N-m uniformly during 1/2 revolution and remains constant for the following revolution. It then falls uniformly to 750 N-m during the next 1/2 revolution and remains constant for one revolution, the cycle being repeated thereafter. Determine the power required to drive the machine and percentage fluctuation in speed, if the driving torque applied to the shaft is constant and the mass of the flywheel is 500 kg with radius of gyration of 600 mm.	5	5	3,4	1,2	1.4.1
Q5.	Attempt any two parts of the following.					
a)	Write a short note on primary and secondary balancing	5	6	2	2	2.1.1
b)	A, B, C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. a) Find the required mass A and b) The relative angular settings of the four masses so that the shaft shall be in complete balance.	5	6	3,4	1,2	1.4.1
c)	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.	5	6	3,4	1,2	1.4.1
