Q.P.Code: 23ME0310	R23	H.T.No.									

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech. II Year II Semester Supplementary Examinations December-2025
THEORY OF MACHINES
(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 70**

PART-A
(Answer all the Questions **10 x 2 = 20** Marks)

1	a	Define Grashof's law.	CO1	L1	2M
	b	Explain Kutz bach criterion	CO1	L2	2M
	c	Explain the Displacement .	CO2	L2	2M
	d	Write the relation between Velocity and acceleration.	CO2	L1	2M
	e	What are the essential components of a basic gyroscope?	CO3	L1	2M
	f	What is the difference between a simple gear train and a compound gear train?	CO3	L1	2M
	g	What are the two main types of balancing techniques used for rotating masses?	CO5	L1	2M
	h	Explain the significance of the "pressure angle" in a cam design?	CO5	L2	2M
	i	What is meant by natural frequency?	CO6	L1	2M
	j	Define resonance.	CO6	L1	2M

PART-B
(Answer all Five Units **5 x 10 = 50** Marks)

UNIT-I

2		Explain the inversions of four bar mechanism with neat sketch and list out the practical applications of inversions?	CO1	L2	10M
		OR			
3		What are the practical applications of inversions of the double slider crank chain? Explain all with neat sketch.	CO1	L1	10M

UNIT-II

4		In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB is 40mm long and rotates at 120 r.p.m. clockwise, while the link CD = 80 mm oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60°.	CO2	L3	10M
		OR			
5		Explain the following terms: (a) Instantaneous centre (b) Body centrode and space centrode (c) Axode	CO2	L2	10M

UNIT-III

6		Explain the classification of gears with neat sketches	CO4	L2	10M
		OR			
7	a	What is Reactive gyroscopic couple?	CO3	L1	5M
	b	The turbine rotor of a ship has a mass of 8 tonnes and a radius of gyration 0.6 m. It rotates at 1800 r.p.m. clockwise, when looking from the stern. Determine the gyroscopic couple, if the ship travels at 100 km/hr and steer to the left in a curve of 75 m radius.	CO3	L3	5M

UNIT-IV

8		A cam drives a flat reciprocating follower in the following manner: During first 120° rotation of the cam, follower moves outwards through a distance of 20 mm with simple harmonic motion. The follower dwells during next 30° of cam rotation. During next 120° of cam rotation, the follower moves inwards with simple harmonic motion. The follower dwells for the next 90° of cam rotation. The minimum radius of the cam is 25 mm. Draw the profile of the cam.	CO5	L3	10M
		OR			
9		Design a cam for operating the exhaust valve of an oil engine. It is required to give equal uniform acceleration and retardation during opening and closing of the valve each of which corresponds to 60° of cam rotation. The valve must remain in the fully open position for 20° of cam rotation. The lift of the valve is 37.5 mm and the least radius of the cam is 40 mm. The follower is provided with a roller of radius 20 mm and its line of stroke passes through the axis of the cam	CO5	L3	10M

UNIT-V

10		The turning moment diagram for a four stroke gas engine may be assumed for simplicity to be represented by four triangles, the areas of which from the line of zero pressureare as follows : Suction stroke = 0.45 × 10–3 m2; Compression stroke = 1.7 × 10–3 m2; Expansion stroke = 6.8 × 10–3 m2; Exhaust stroke = 0.65 × 10–3 m2. Each m2 of area represents 3 MN-m of energy. Assuming the resisting torque to be uniform, find the mass of the rim of a flywheel required to keep the speed between 202 and 198 r.p.m. The mean radius of the rim is 1.2 m.	CO6	L3	10M
		OR			
11		A single cylinder, single acting, four stroke gas engine develops 20 kW at 300 r.p.m. The work done by the gases during the expansion stroke is three times the work done on the gases during the compression stroke, the work done during the suction and exhaust strokes being negligible. If the total fluctuation of speed is not to exceed ± 2 per cent of the mean speed and the turning moment diagram during compression and expansion is assumed to be triangular in shape, find the moment of inertia of the flywheel.	CO6	L3	10M

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