

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

B.Tech. II Year II Semester Regular & Supplementary Examinations March/April-2026

THEORY OF MACHINES

(Mechanical Engineering)

Time: 3 Hours

Max. Marks: 70

PART-A

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

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|---|---|---|-----|----|----|
| 1 | a | Define Grashof's law. | CO1 | L1 | 2M |
| | b | Describe the Transmission angle. | CO1 | L2 | 2M |
| | c | Write the relation between Velocity and acceleration. | CO2 | L1 | 2M |
| | d | Explain the Displacement . | CO2 | L2 | 2M |
| | e | How the gear ratio is calculated for simple gear train with two gears? | CO3 | L2 | 2M |
| | f | Name two common applications of gyroscopes in modern technology. | CO4 | L1 | 2M |
| | g | What are the two main types of balancing techniques used for rotating masses? | CO5 | L1 | 2M |
| | h | What is a cam profile? | CO5 | L1 | 2M |
| | i | Distinguish damped and undamped vibrations. | CO6 | L2 | 2M |
| | j | Define amplitude in the context of vibration. | CO6 | L1 | 2M |

PART-B

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

UNIT-I

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| 2 | | Explain the classification of the kinematics pairs in detail with neat sketch. | CO1 | L2 | 10M |
|---|--|--|-----|----|-----|

OR

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|---|--|---|-----|----|-----|
| 3 | | Explain the inversions of single slider crank chain with neat sketch and list out the practical applications of inversions? | CO1 | L2 | 10M |
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UNIT-II

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| 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

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|---|---|--|-----|----|----|
| 5 | a | What do you understand by the instantaneous centre of rotation in kinematic of machines? Answer briefly. | CO2 | L1 | 5M |
| | b | Explain the following terms: (i) Instantaneous centre (ii) Body centre and space centre (iii) Axode | CO2 | L2 | 5M |

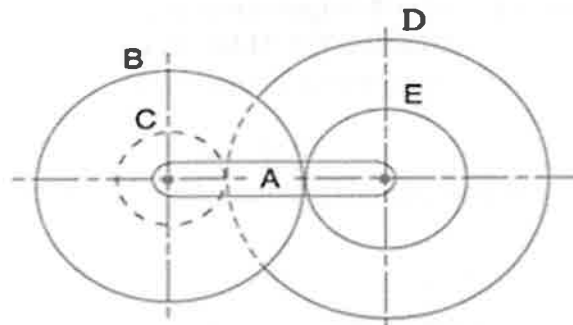
UNIT-III

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|---|---|--|-----|----|----|
| 6 | a | An fighter plane makes a 180 degree turn of 75 m radius towards right, when flying at 280 km/hr. The engine and the propeller of the plane has a mass of 600 kg and a radius of gyration of 0.3 m. The engine rotates at 2800 rpm anticlockwise when viewed from the rear. Find the magnitude of gyroscopic couple and its effect on the aircraft. | CO3 | L3 | 8M |
| | b | What is Reactive gyroscopic couple? | CO3 | L1 | 2M |

OR

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|---|--|---|-----|----|-----|
| 7 | | In a reverted Epicyclic gear train, the arm A carries two gears B and C and a compound gear D - E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D | CO4 | L3 | 10M |
|---|--|---|-----|----|-----|

are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 r.p.m. clockwise.



UNIT-IV

- 8 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. CO5 L3 10M

OR

- 9 A cam is to give the following motion to a knife-edged follower : CO5 L3 10M
 i. Outstroke during 60° of cam rotation ;
 ii. Dwell for the next 30° of cam rotation ;
 iii. Return stroke during next 60° of cam rotation, and
 iv. 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. Develop the profile of the cam when the axis of the follower passes through the axis of the cam shaft .

UNIT-V

- 10 A shaft of length 0.75 m, supported freely at the ends, is carrying a body of mass 90 kg at 0.25 m from one end. Find the natural frequency of transverse vibration. Assume $E = 200 \text{ GN/m}^2$ and shaft diameter = 50 mm. CO6 L3 10M

OR

- 11 The turning moment diagram for a multicylinder engine has been drawn to a scale 1 mm = 600 N-m vertically and 1 mm = 3° horizontally. The intercepted areas between the output torque curve and the mean resistance line, taken in order from one end, are as follows : + 52, - 124, + 92, - 140, + 85, - 72 and + 107 mm², when the engine is running at a speed of 600 r.p.m. If the total fluctuation of speed is not to exceed $\pm 1.5\%$ of the mean, find the necessary mass of the flywheel of radius 0.5 m. CO6 L3 10M

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