

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

B.Tech. IV Year I Semester Regular & Supplementary Examinations December-2024
TRACTOR DESIGN AND TESTING

(Agricultural Engineering)

Time: 3 Hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

UNIT-I

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|---|---|---|-----|----|----|
| 1 | a | Briefly discuss the Hierarchical Development in Tractor Design. | CO1 | L2 | 8M |
| | b | Explain the factors considered for the selection of tractors. | CO1 | L2 | 4M |

OR

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|---|---|---|-----|----|----|
| 2 | a | What is meant by the center of gravity? Explain the determination of the center of gravity by weighing method with a neat sketch. | CO1 | L2 | 6M |
| | b | A tractor weighing 28 kN has wheel base of 2150 mm and moving uphill at no load. Its c.g. is located 900 mm ahead of centre of rear wheel axle and 750 mm above the ground surface. Determine the maximum uphill slope the tractor can climb without overturning backwards. | CO1 | L3 | 6M |

UNIT-II

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|---|---|--|-----|----|----|
| 3 | a | Define Traction and Explain the traction theory. | CO2 | L2 | 6M |
| | b | Determine traction force developed by a track type wheel 30 cm wide and 150 cm contact length weighing 15 kN moving on a soil having following parameters: $C = 1.3 \text{ N/cm}^2$; $K_c = 3$; $\Phi = 28^\circ$. Assume that lugs on the track are such that the soil is sheared off in a plane area at ends of lugs. | CO2 | L3 | 6M |

OR

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|---|---|--|-----|----|----|
| 4 | a | What are the design requirements of the hitch system for farm machinery? | CO2 | L2 | 6M |
| | b | Explain about the power transmission system with neat sketch. | CO2 | L2 | 6M |

UNIT-III

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|---|---|--|-----|----|----|
| 5 | a | Define the steering system of the tractor and explain the components of the mechanical steering system with a neat sketch. | CO3 | L2 | 9M |
| | b | Write about the good steering qualities of the tractor. | CO3 | L1 | 3M |

OR

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|---|---|---|-----|----|----|
| 6 | a | Explain the working principle of the power steering system with a neat sketch. | CO3 | L2 | 6M |
| | b | If a 250-N force is applied to the top of a piston of the hydraulic actuator and the force produces 750 Pa of pressure. Determine the area as well as the diameter of the piston. | CO3 | L3 | 6M |

UNIT-IV

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|---|---|---|-----|----|----|
| 7 | a | Explain the design features of the cylinder and cylinder head. | CO4 | L2 | 6M |
| | b | A four-cylinder, 4-stroke cycle diesel engine develops 40 kW power at 35 revolutions/s. The mean effective pressure in each cylinder is 85 bars and the mechanical efficiency of the engine is 80%. Calculate the following 1. Diameter of cylinder 2. Stroke of piston if stroke bore ratio is 1.25:1. | CO4 | L3 | 6M |

OR

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|---|---|--|-----|----|----|
| 8 | a | Explain the hydraulic control system of the tractor with all components. | CO4 | L2 | 5M |
| | b | Explain the design of the operator seat in the tractor with a neat sketch. | CO4 | L2 | 7M |

UNIT-V

- 9 a Explain about position and draft control systems of tractor. **CO5 L2 6M**
b A four-cylinder 4 stroke gas engine has cylinder diameter of 25 cm, stroke bore ratio is 1.8, clearance volume 4500 cm³, engine speed 240 rpm, mean effective pressure 700 kPa and mechanical efficiency is 75%. Calculate (i) indicated power, (ii) brake power, (iii) compression ratio, (iv) swept volume. **CO5 L3 6M**

OR

- 10 a Explain about commercial and confidential tests carried out by BIS. **CO5 L2 6M**
b Define testing and evaluation. Explain about the procedure of testing. **CO5 L2 6M**

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