

**B.TECH**  
**(SEM VIII) THEORY EXAMINATION 2017-18**  
**TRACTOR DESIGN PRINCIPLES**

Time: 3 Hours

Total Marks: 100

**Note:** Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

**1. Attempt all questions in brief. 2 x 10 = 20**

- a. What are the functions of differential system?
- b. Define centre of gravity of tractor.
- c. What do you mean by hitch lift capacity and stability?
- d. What is the work of power take off in tractor?
- e. For what purpose crawler tractors are used?
- f. Define rolling resistance.
- g. Briefly explain about draft control and position control.
- h. How a constant mesh type gear box works?
- i. Write about weight transfer phenomena of an agricultural tractor.
- j. Define caster angle and camber angle.

**SECTION B**

**2. Attempt any three of the following: 10 x 3 = 30**

- a. What are the performance characteristics of tractor engines? Explain with the help of various curves.
- b. A tractor has an engine speed of 2000 rev/ min, rear wheel diameter 115 cm and the travel speed is 3 km/ hour. Find the ratio between crankshaft speed and rear axle speed.
- c. Design a three speed gearbox for a tractor to give speed variation between 200 and 600 rpm. The input shaft from the tractor engine runs at 1600 rpm. Assume any other data if necessary.
- d. Write about different components and working of hydraulic system of a tractor.
- e. Explain hitching system of tractor with the help of neat sketch.

**SECTION C**

**3. Attempt any one part of the following: 10 x 1 = 10**

- a. Explain the design procedure of hydraulic cylinders.
- b. What are important test conditions of a tractor? How belt performance test differ from drawbar performance test?

**4. Attempt any one part of the following: 10 x 1 = 10**

- a. Explain the design procedure of Ackerman steering system in detail.
- b. What are the important considerations for ergonomic design of tractor seat?

**5. Attempt any one part of the following: 10 x 1 = 10**

- a. What do you mean by transmission system of a tractor? Explain its main functions and components.
- b. Design a seat suspension for:

- i. Seat and operator mass of 100 kg.
- ii. Transmissibility of 0.400
- iii. Tractor chassis frequency of 5 Hz
- iv. Static spring deflection of seat and operator of 10 cm.

Determine: undamped natural frequency of the seat, spring & shock absorber design values and the decibel reduction in RMS acceleration that the seat suspension provides.

**6. Attempt any *one* part of the following: 10 x 1 = 10**

- a. Explain the design of instrument panel of tractor.
- b. Design a clutch for a tractor. Assume the appropriate data which is necessary.

**7. Attempt any *one* part of the following: 10 x 1 = 10**

- a. What are the safety features should be in a tractor? Explain the safety guidelines during tractor trolley use.
- b. A tractor is fitted with a four cylinder, 4-stroke cycle diesel engine. It is operating at a speed of 2000 rpm. If its cylinder diameter is 110 mm and stroke length is 140 mm, calculate:
  - i. Stroke-bore ratio.
  - ii. Piston speed.
  - iii. Displacement volume.