

B.TECH
(SEM VIII) THEORY EXAMINATION 2018-19
MECHANICS OF TILLAGE AND TRACTION

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. Define ply rating of a tyre.
 - b. What do you mean by rim pull of a tractor?
 - c. What should be Inflation pressure in rear and front tyre of a tractor?
 - d. What are the traction aids? Give some examples.
 - e. Define conservation tillage.
 - f. What are the applications of GIS in soil dynamics?
 - g. How compaction affects the plant growth? Explain in brief.
 - h. What are the factors affecting drawbar performance of a tractor?
 - i. Define tractive efficiency. Write about the parameters that can affect the tractive efficiency.
 - j. What do you mean by tractor hitching? Write about its type.

SECTION B

- 2. Attempt any three of the following: 10 x 3 = 30**
- a. Define soil. Write about its engineering properties in detail.
 - b. A tractor having weight as 1500 kg is brought to a speed of 10 km/hr in 10 seconds by applying a uniform acceleration. Calculate initial force on tractor.
 - c. What do you mean by traction prediction? Explain the Bekker's theory.
 - d. A 25 hp tractor is running at 1000 rev/min, total reduction of speed is 10:1, find the tractive force at each driving wheel, if the diameter of driving wheel is 1.32 meters.
 - e. A tractor moves 20 m distance in 5 revolution of rear wheels at no load on firm ground and 14.6 m in 5 revolutions when ploughing the field with a mounted M.B. plough. Calculate the slippage in tractor wheels.

SECTION C

- 3. Attempt any one part of the following: 10 x 1 = 10**
- a. For what purpose tensiometer is used? Explain its working with the help of a neat sketch.

- b. A four bottom 30 cm M.B. plough has a working depth of 17 cm and draft of 1700 kg. The working speed of tractor is 5 kmph. If the field efficiency is 75% then calculate:
- Unit draft.
 - Power required.
 - Field capacity.

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

- What are the main forces acting upon a tillage implement? Explain with the help of diagrammatic representation.
- A rear wheel drive tractor weighing 28kN is pulling a load on a soil surface in such a way that reactions on front and rear wheels are 10 kN and 18 kN respectively, which has following parameters:

Soil cohesion = 1.2 N/cm², Angle of soil friction = 21°, Tractor tyre width = 286 mm

Length of contact of tyre = 550 mm, Cohesion modulus of deformation = 3

Friction modulus of deformation = 0.5, coefficient of sinkage of soil = 0.2

Assume that lugs on tyre are such that the soil is sheared off in a plane area at the ends of lugs. Calculate the maximum drawbar pull developed by the tractor.

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

- What are the main forces involved for mechanics of tractor chassis?
- The total weight of a track type tractor is 20 kN, has contact length 150 cm and track width 35 cm. Calculate the traction force developed if : $C = 1.3 \text{ N/cm}^2$, $\phi = 28^\circ$

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

- Define Centre of gravity of tractor. Find the position of Centre of gravity by using weighing method.
- Explain tyre testing variability in detail.

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

- A rear wheel drive tractor having a total weight of 35 kN with a wheel base 2200 mm and centre of gravity is 800 mm ahead of rear wheel axle center line. The tractor is pulling a load of 16 kN on concrete road at forward speed of 6 kmph and drawbar height is 400 mm. the axle power is 35 kW. Calculate :
 - Weight transfer to the rear wheels
 - Coefficient of traction
 - Tractive efficiency
- What are the measures for optimizing crop growth by avoiding excessive soil compaction? Discuss in detail.