**Fpme.3109**          **Tractor Systems and Controls (2+1)**          **Marks: 50**
**Time: 2 hours**

**I          Choose the correct answer**                                   **(10x1=10)**

1. Which component helps distribute power to the wheels while allowing them to rotate at different speeds?
   A)   Clutch
   B)   Differential
   C)   Gearbox
   D)   PTO

2. The braking Torque in a tractor is calculated using the formula:
   A)   Braking Torque = Force × Distance
   B)   Braking Torque = Force / Distance
   C)   Braking Torque = Force × Radius
   D)   Braking Torque = Force / Radius

3. The gear ratio in a tractor transmission system is determined by:
   A)   The size of the engine
   B)   The number of teeth on the gears
   C)   The type of clutch used
   D)   The weight of the tractor

4. Which component is responsible for changing the speed and Torque of a tractor?
   A)   Clutch
   B)   Gearbox
   C)   Differential
   D)   Brake system

**Fill in the blanks**

5. The ……….. is responsible for transferring power from the engine to the wheels of tractor.
6. The purpose of a Power Take-Off (PTO) is to transfer ……........ from the tractor to an implement.

**State True or False**

7. A tractor's center of gravity should be as low as possible for better stability.
8. Pneumatic tyres have higher rolling resistance compared to solid tyres.

**Define the following**

9. Final drive
10. Steering Geometry

**II          Write short notes on ANY FIVE of the following**                **(5x2=10)**

1. Functional requirements of a clutch system in tractors
2. Role of ballast in maintaining tractor stability
3. Importance of rolling resistance in tractor performance
4. Key features of Ackerman steering geometry
5. Briefly describe power transmission in a Power Tiller.
6. Concept of weight transfer and its significance in tractor operation
7. Importance of PTO in agricultural tractors

**III**    **Answer ANY FIVE of the following**                                                        **(5x4=20)**

1. Explain the construction and working of a dual-clutch system.
2. Describe the principles and workings of a planetary gear system in the final drive.
3. With a diagram, explain the functional components of the hydraulic system.
4. Discuss the forces acting on a tractor during operation and their impact on stability.
5. Explain the types of steering systems used in tractors and their applications.
6. Describe the functional components and role of the transmission system in a tractor.
7. A tractor with a weight of 25 kN is pulling a load at a speed of 8 kmph. The rolling resistance is 0.02, and the coefficient of traction is 0.6. Calculate the maximum drawbar pull and tractive efficiency.

**IV**    **Write an essay on ANY ONE of the following**                                            **(1x10=10)**

1. Discuss ergonomic considerations in tractor design and their impact on operator efficiency and safety.
2. Explain the recent technologies advancements in hydraulic systems used in modern tractors.

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