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UACE P515/2 Principles and practices of agriculture2 2004

**3 hours**

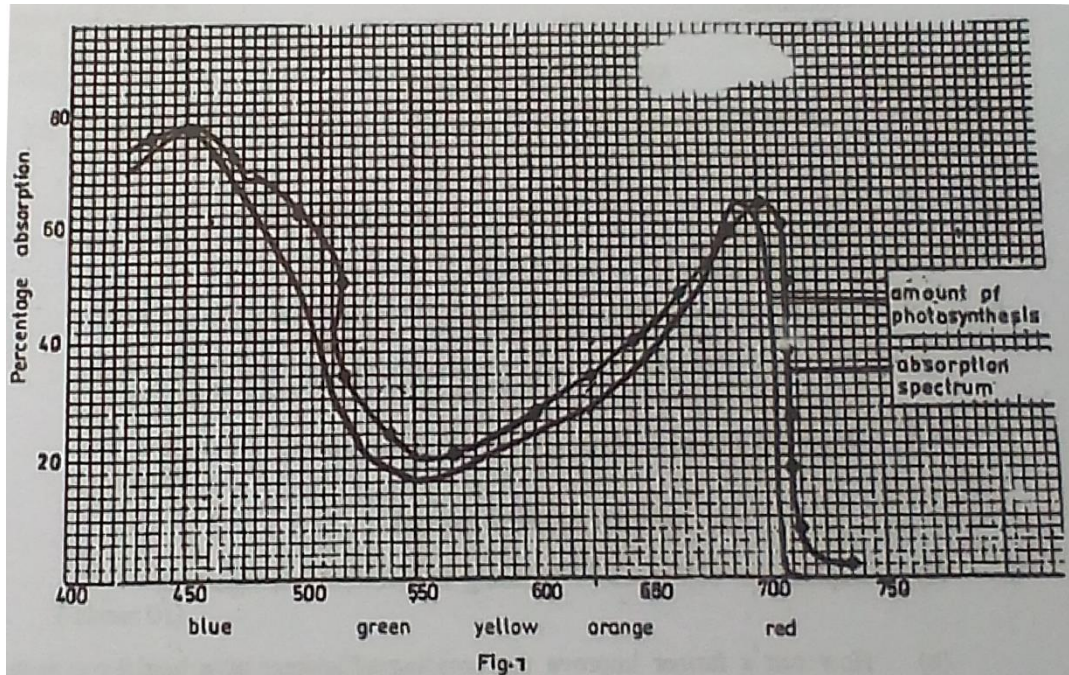
**Instructions**

- This paper consists of sections: **A, B, C, D and E**
- Answer **question 1** in section A and **four** other questions, selecting **one** from each of the sections **C, D and E**.
- Write your answers in the answer booklets provided
- Any additional question(s) answered will not be marked

SECTION A (20MARKS)

Question1 is compulsory

1. Figure 1 shows the relationship between the absorption of different wavelength of light and amount of photosynthesis in a plant.



- (a) Describe the pattern of the curve in the graph. (04marks)
- (b) From the graph, what conclusion can be drawn regarding light absorption and amount of photosynthesis in a plant? (10marks)
- (c) Outline the various ways in which plants are adapted to capturing light for photosynthesis. (06marks)

SECTION B (20 MARKS)

2. (a) Using illustrations, explain the relationship between demand, supply and price in a competitive market (10marks)
- (b) What problems are associated with marketing of agricultural products? (10marks)

3. (a) Explain the land and management systems and practices that limit agricultural production. (12marks)
- (b) Outline the advantages of small scale farming in developing countries. (08marks)

**SECTION C (20 MARKS)**

- 4 (a) Discuss the factors that have contributed to popularity of maize crop in East Africa. (12marks)
- (b) What measures can be taken to reduce damage by pests on stored maize
- 5 (a) Outline the undesirable characteristic of natural pasture. (05marks)
- (b) Explain the factors to consider when planning establishing a pasture (10 marks)
- (c) What is the advantage of including legumes in a pasture. (05marks)

**SECTION D (20 MARKS)**

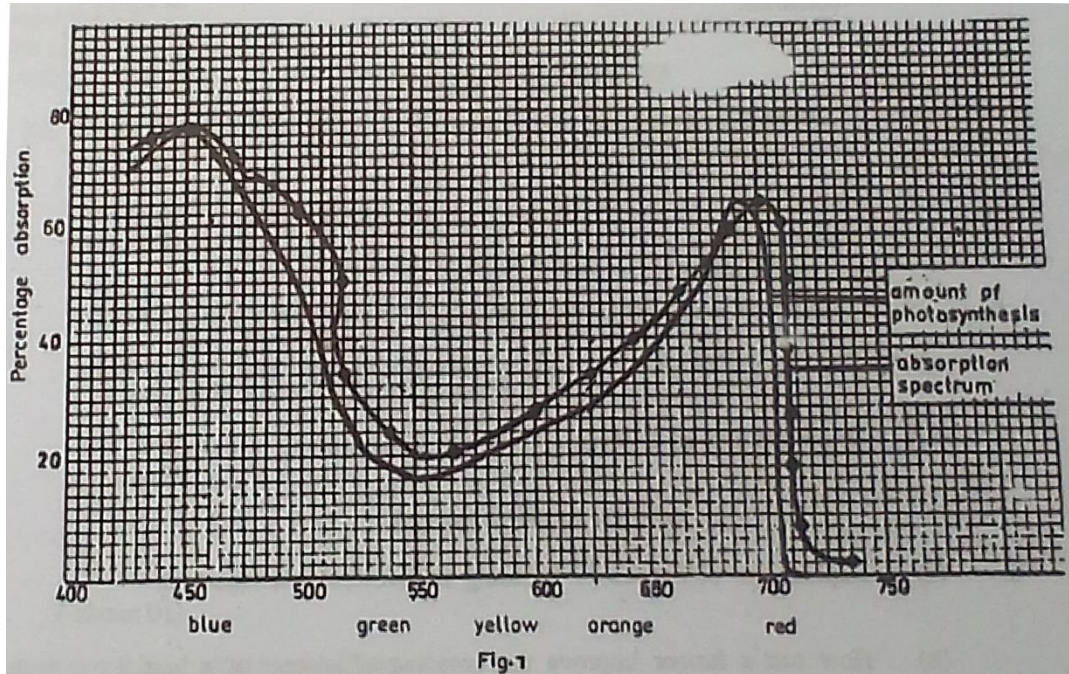
6. (a) Explain the objectives of breeding in livestock management. (10marks)
- (b) How can a farmer improve the breeding efficiency of a herd? (10marks)
7. (a) Explain the role of hormones in the process of milk secretion and milk let down. (05marks)
- (b) Discuss the factors that affect the amount of milk produced by a dairy cow. (15marks)

**SECTION E (20 MARKS)**

8. (a) With the aid of a diagram, explain the working of the coil ignition system of a tractor (12marks)
- (b) Outline the faults that may lead to the failure of the coil system. (08marks)
9. (a) Explain the functions of the components of the transmission system of tractor.(12marks)

## Suggested answers

1. Figure 1 shows the relationship between the absorption of different wavelength of light and amount of photosynthesis in a plant.

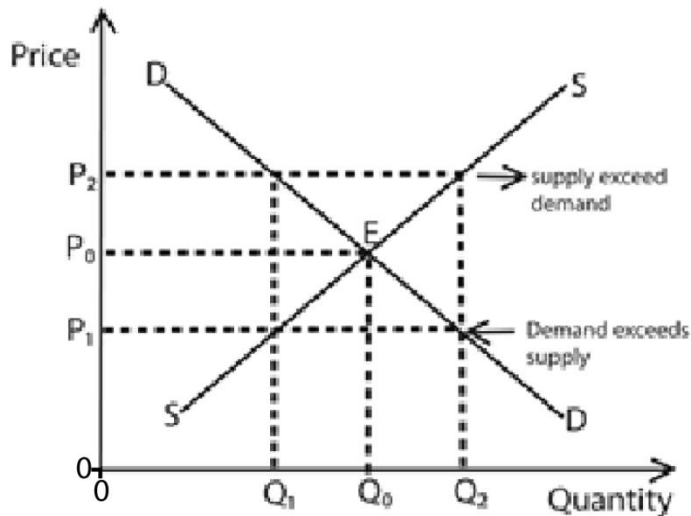


- (a) Describe the pattern of the curve in the graph. (04marks)
  - The absorption spectrum
- (b) From the graph, what conclusion can be drawn regarding light absorption and amount of photosynthesis in a plant? (10marks)
- (c) Outline the various ways in which plants are adapted to capturing light for photosynthesis. (06marks)

## SECTION B (20 MARKS)

2. (a) Using illustrations, explain the relationship between demand, supply and price in a competitive market (10marks)

In this market, prices are determined by forces of demand and supply.



- At high price  $OP_2$  supply exceeds demand and therefore a surplus  $Q_0Q_2$  is created. When supply is in excess, the producer decreases the price in order to sell the surplus (excess) and in the process equilibrium is restored in the market at point E.
- At lower price  $OP_1$ , quantity demanded exceeds quantity supplied therefore a shortage  $Q_1Q_0$  is created which forces the producer (seller) to increase the price until the equilibrium is restored at E.

#### Note

- **Market price** refers to the prevailing (ruling) price in the market at a given time. Market price is any price determined by the buyers and sellers in the market irrespective of whether quantity demanded is equal to quantity supplied at a given.
- **Equilibrium price** refers to the market price where quantity demanded is equal to quantity supplied.
- **Normal (natural) price** refers to the long run equilibrium price established in the market after a long period of price fluctuations.
- **Reserve price** refers to the minimum price set by the seller below which he is not willing to sell his commodity.

(b) What problems are associated with marketing of agricultural products? (10marks)

- Distant markets
- Lack of market information
- Bulkiness of the products making it difficult to transport to places where they are demanded
- Lack of preservation facilities to sell in time of scarcity
- Poor transport system that fails transportation of agricultural products
- Long biological lag makes it difficult to increase supply in short run
- Weather uncertainties may disrupting production
- Use of poor technology leading to low production
- Low production due to few farmers

- Seasonality making them to be in excess in certain part of the year and in short supply in the other part of the year e.g. grasshoppers (ensenene)
- Lack of storage facilities store excess
- Lack of inputs such as land
- Price fluctuations
- Inelasticity of demand

3. (a) Explain the land and management systems and practices that limit agricultural production.

(12marks)

- Land fragmentation hinders mechanization and agricultural production.
- Land fragmentation hinder effective delivery extension service
- Lack of land ownership prevents long term planning
- Monoculture cause soil exhaustion
- Ineffective pest and disease management reduce crop yield
- Deforestation leads soil erosion and deterioration and
- Destruction of vegetation covers for lumbering, charcoal burning etc. cause soil degradation
- Agricultural practice/activities such as use of agrochemical/fertilizers, herbicides
- Industrialization i.e. emission of industrial fumes and effluents, dumping of industrial solid wastes pollutes environment.
- Urbanization reduces agricultural land lowering agricultural production
- Urbanization provides market to agricultural produce encouraging agricultural production
- Road construction encroaches on agricultural land reducing agricultural production.
- Settlement/urbanization which creates run-off thus causing periodic flooding leading to destruction of crops.
- Bush burning destroys vegetation cover and transforms the original vegetation cover into secondary and low quality vegetation types that cannot support livestock.
- Mining and quarrying which leave deep hollows that may harbor disease causing vectors reducing health of farmers and agricultural production
- Drilling of boreholes which destabilize the water table and soil profile leading to low agricultural production
- Poor fishing methods such as overfishing and use of poisons depletes fish from water bodies such as L. Victoria lower fish production.

(b) Outline the advantages of small scale farming in developing countries. (08marks)

- **Sustainability:** It often employs eco-friendly practices, reducing environmental impact.
- **Biodiversity:** Diverse crops help maintain soil quality and support local ecosystems.
- **Community Support:** It creates jobs and supports local economies.

- **Food Security:** Small farms can provide a stable food supply for local communities.
- **Cost Efficiency:** Lower reliance on expensive machinery and chemicals.
- **Soil Health:** Practices like crop rotation and organic farming improve soil fertility.
- **Flexibility:** Ability to adapt quickly to market demands and environmental changes.
- **Quality Produce:** Often results in fresher, higher-quality products.

### SECTION C (20 MARKS)

4 (a) Discuss the factors that have contributed to popularity of maize crop in East Africa. (12marks)

- Maize has many uses such as animal feed, human food, brewing etc.
- Improved maize is a high yield crop
- Maize grow in diverse climate and soil conditions
- It is fast growing crop
- Has high nutrition value with high proportion of carbohydrates and proteins
- Easy to grow
- Improved varieties are resistant to pests and disease.
- Easy to preserve as dry grain.
- Maize farm can help soil conservation and improve soil fertility when used in crop rotation.
- Efficiently respond to fertilizer application
- Easily processed into floors

(b) What measures can be taken to reduce damage by pests on stored maize. (08 marks)

- **Proper Drying:** Ensure maize is thoroughly dried before storage. Moisture content below 14% prevents mold and pest infestation<sup>1</sup>.
- **Clean Storage Facilities:** Clean and sanitize storage facilities and containers before storing new maize.
- **Store resistant variety**
- **Chemical control:** appropriate fumigants and insecticides should be used before storage
- **Hermetic Storage:** Use hermetic storage bags or containers that are airtight to prevent pests from accessing the maize. These containers also help maintain low moisture.
- **Regular Monitoring:** Regularly inspect stored maize for signs of pest infestation. Early detection can help in taking timely measures to prevent further infection.
- **Biological Control:** Utilize natural predators or biological agents that target specific pests.
- **Timely Harvesting:** Harvest maize at the right time to minimize the risk of pest infestation.

5 (a) Outline the undesirable characteristic of natural pasture. (05marks)

- They are less productive in terms of herbage yields and nutritive value.
- The grasses mature very fast becoming stemy and coarse hence reducing palatability and nutritive value.

- They are usually grazed communally hence high chances of more livestock using it leading to overgrazing.
- Due to poor management of natural pasture livestock diseases spread very fast from herd to herd.
- High renovation/improvement costs.
- Nature pastures are highly dependent on climate and weather i.e. are easily destroyed by flood and prolonged draughts.
- Easily invaded by weeds

(b) Explain the factors to consider when planning establishing a pasture (10 marks)

- Type of soil (pH, drainage, fertility) – different pasture species survive on different soil type
- Topography – different pasture species prefer different topography
- Climate – drought resistant pasture are preferred
- Pest and disease resistance
- Presence of planting materials and/or seeds
- Cost of production – The farmer should make sure that the expense involved in pasture establishment can be met from the income of the animals.
- Grazing tolerance: it is important to select a species that can withstand the grazing habits of livestock
- Ability of species to survive winter conditions
- The type of livestock and their nutritional needs influence the choice of pasture
- Legume percentage in mix: including legumes in the pasture mix can improve soil nitrogen levels and provide a more balanced diet for livestock.
- Digestibility of pasture
- Palatability of the pasture species to intended livestock
- Ability to produce enough herbage

(c) What is the advantage of including legumes in a pasture. (05marks)

- Legumes fix nitrogen into the soil that may be used by grass
- Legumes are deep rooters; this helps them to absorb nutrients from the deeper layers of the soil and help in nutrient recycling especially when they shade their leaves on the surface or die.
- Legumes increase palatability and nutritive value of the pasture thus minimizing the need for supplementary feeding
- Because of the rooting habit of legume, they are resistant to drought
- Legume provide good soil cover and supply more organic matter to the soil which help to minimize soil erosion and conserve soil
- A mixture of legume and grasses give a higher yield of herbage than either grasses or legume planted alone
- The mixture reduces management costs by reducing the frequency and intensity of weeding and fertilizer application

## SECTION D (20 MARKS)

6. (a) Explain the objectives of breeding in livestock management. (10marks)

- To increase the yield of milk and meat of farm animals
- To increase adaptability of farm animals to local environmental conditions.
- Increase the growth rate and maturity in farm animal.
- To increase animals' ability to respond to good animal management.
- To increase animals' resistance to diseases
- To multiply farm animals.
- To improve fertility of farm animals
- To enhance conversion efficiency in farm animal
- To improve physical appearance of farm animals
- To improve resilience, temperament, speed and traction in work animals.

(b) How can a farmer improve the breeding efficiency of a herd? (10marks)

- **Good feeding:** Breeding animals should be fed well but excessive fattening should be avoided as it may reduce the fertility.
- **Observing the rest period:** Animals should be given a rest period of about 60 days to allow the uterus to return to normal
- **Insemination at the right time:** In case of artificial insemination, the cow should be inseminated towards the middle and late part of heat period as ovulation occurs 14 hours after the beginning of estrus.
- **Observation of animals on heat:** This should be done as early as possible more especially where artificial insemination is being used to avoid the animal missing service.
- **Veterinary Attention:** Animals that fail to conceive should be identified and examined to find out the causes and treated if possible.
- **Pregnancy diagnosis:** Animals should be diagnosed to find out whether they have conceived or not so that appropriate measures can be taken in time.
- **Keep accurate breeding records** for the herd to be used as reference were necessary
- Use **teaser bulls** for early detection of heat in farm animals for early service
- **Maintain a good ratio of bulls to females to avoid** over working the bulls which lowers fertility
- **Use correct techniques of artificial insemination** to ensure successful fertilization hence high breeding efficiency
- **Females with abnormal discharges** should be examined and treated early enough
- **Know a complete breeding** history of the animals before buying it into the farm

7. (a) Explain the role of hormones in the process of milk secretion and milk let down. (05marks)

- prolactin, ACTH, somatotrophin (SHT) and thyrotrophin (TSF) initiate milk secretion in the alveoli of udder
- oxytocin. Oxytocin causes contraction of muscles surrounding the **alveoli in the udder promoting milk-let down**
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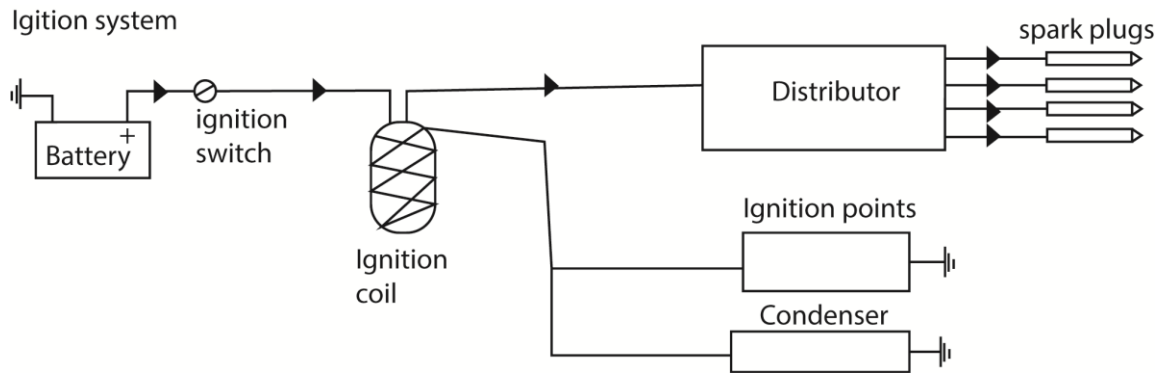
(b) Discuss the factors that affect the amount of milk produced by a dairy cow. (15marks)

- **Breed:** Friesians produce large amounts of milk but of low butter fat while the indigenous produce less milk of high butter fat.
- **Age:** older cows produce more milk than the young. However, the butterfat of the milk produced by the older cows is lower than that of the young cows.
- **Period of lactation:** milk yield increases until the 7<sup>th</sup> week then it starts declining up to drying off.
- **Animal Health:** sick animals give less milk which may also contain antibodies and drugs more especially after treatment.
- **Animal Temperament:** quiet animals are the best milkers while nervous cows which kick about give less milk.
- **Water Supply:** water is needed for the health of the cow and also in the manufacture of milk since it is 87% water. Provision of enough water increases milk yield
- **Food eaten:** animals fed on concentrates will produce more milk which is of better quality than those feed on the ration full of roughages.
- **Season of the year:** during the rainy season cows produce milk with high butter fat content. The quantity of milk is also high due to the abundant pastures and water.
- **Heat Period:** Oestrus causes a slight decline in milk production which may be due to the reduced feed intake. The butterfat content of the milk can also fluctuate by 1% above / below normal.
- **Temperature:** high temperatures reduce milk yield due to the increased evaporation of water of water from the animal's body.
- **Management:** proper feeding of animal and better handling during milking will increase the quality and quantity of milk produced. Rough handling leads to the increase of adrenalin and hence milk hold up.
- **Milking Interval:** the greater the number of milking times, the higher the amount of milk produced. However, morning milking produces milk with higher butter fat content.

#### SECTION E (20 MARKS)

8. (a) With the aid of a diagram, explain the working of the coil ignition system of a tractor (12marks)

The ignition system is used for starting and powering the engine. It is responsible for generating the high-voltage electrical spark required to ignite the air-fuel mixture in the combustion chamber, leading to the combustion process and power generation.



- The **battery** is the primary power source for the ignition system because it transfers the energy to the system when the ignition switch is turned on. The function of a battery is to store **charges and release them when needed.**
- **Ignition switch** turns the system on and off.
- **Ignition coil** is a transformer that converts the low-voltage electrical current from the battery into a high-voltage current needed to create the spark.
- **Ignition distributor:** distributes the current to the spark plugs of a multi-cylinder engine.
- **The spark plug** generates the spark inside the cylinder by using the high voltage ignition coil to ignite the fuel-air mixture.

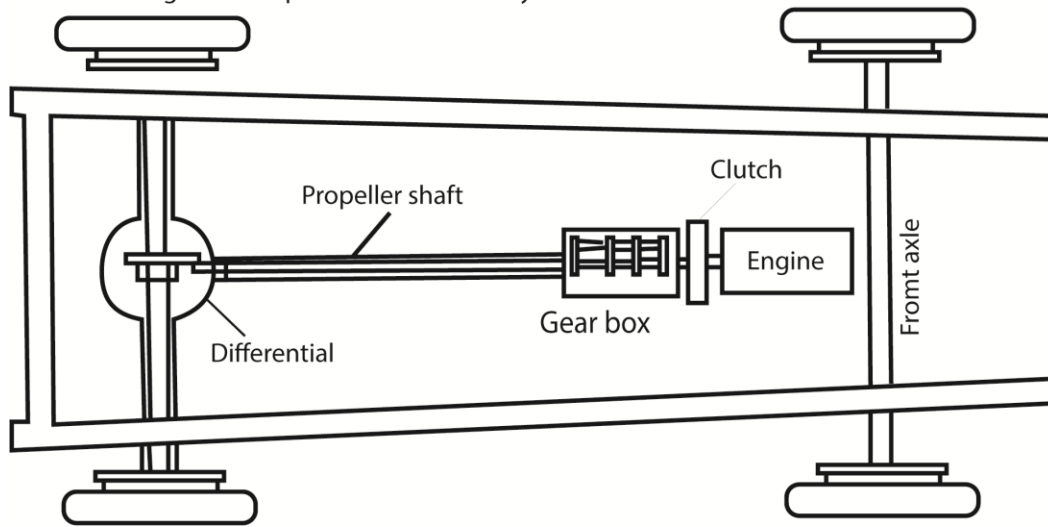
(b) Outline the faults that may lead to the failure of the coil system. (08marks)

- Worn or damaged plugs
- Excessive heat
- Excessive vibrations
- Electrical overload
- Moisture and contamination that can cause short circuit or corrosion of the system
- Faulty wiring
- Age and wear

9. (a) Explain the functions of the components of the transmission system of tractor.(12marks)

Transmission system is a system that transmits power developed by the engine to the road wheels to propel the vehicle

General arrangement of power transmission system



The rotary motion of the crankshaft gives rise to torque and transmission of this torque to road wheels give rise to a propulsive force or tractive effort causing the movement of wheels on the road.

#### 1. Clutch:

This component enables the engine to keep disconnected from road wheels.

The rotary motion available at the crankshaft is not transferred to road wheels. It allows the transfer of motion when desired by the driver of the automobile.

Clutch also allows the transfer of motion gradually so that the vehicle starts moving gradually. It works on the principle of friction.

#### 2. Gearbox:

It consists of some pairs of gear wheels. These transmit the motion available from the crankshaft, through the clutch, at different speeds.

This provides required leverage between the engine and the road wheels. This leverage is variable to cope up the different conditions encountered during the movement of the vehicle.

#### 3. Propeller shaft:

The third component of the automobile transmission system, which transfers motion from the gearbox end to the differential end. The distance between the two can be large, and therefore, it is a shaft which is thin and long to connect the two.

#### 4. Differential:

One of the requirements of the transmission system is to turn the motion through 90 degrees as the axis of the propeller shaft and live axle are at a right angle to each other. This is performed by the differential through wheel and pinion arrangement.

Another function performed by the differential is the variation in the speeds of inner and outer wheels when the vehicle is taking a turn.

### **5. Live axle:**

The axle where motion from the crankshaft of the engine is transferred is known as a live axle. The other axle takes up only the load of the vehicle and therefore is termed as dead axle or simply the axle.

The motion is generally transferred to the rear axle, but it can be transferred to the front axle or both the axles. When the motion is transferred to both the axles, it is known as four-wheel drive.

(b) Outlines common faults of the transmission system (08marks)

- Leaking seals
- Worn out clutch plate
- Old Transmission Fluid/Filter
- Broken Sensor
- Slipping Gears
- Worn Torque Converter
- Faulty Shift Solenoids
- Overheating Transmission
- Broken Transmission Bands
- Rough Shifting/Slipping Out of Gear

END

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