IFS Agricultural Engineering Papers 2007

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Paper-I

Section A

1. Answer any four subparts not exceeding 150 words for each subpart:
   a. Mention the causes of soil erosion in India. What measures you will suggest to control the soil erosion (10) ?
   b. Define the runoff. What are the factors that affect the runoff (10) ?
   c. Calculate the total capacity of the pond required in deep black soils for 10 ha watershed if the mean annual rainfall is 500 mm and the mean annual runoff is 10% . Assume siltation rate of 5 tonnes/halyear and a desiltation period of 6 years. The bulk density of soil under wet conditions is 1.2gram/cc (10) .
   d. What are the runoff samplers? How they are important in soil and water conservation research work (10) ?
   e. Give a brief note about the extent of wind erosion in India. How the wind erosion is harmful to the agricultural lands (10) ?
2. Answer the following questions
   a. Show with a diagram the different components of a permanent soil conservation drop structure. What role is played by each component (10) ?
   b. State the Rational formula for estimating the peak rate of runoff from the small watersheds. List out the basic assumptions made under the Rational formula (10) .
   c. Mention the possible reasons of error in the measurement of rainfall from the Syphon and Float type of recording gauges (10) .

d. Illustrate with figure the rainfall pattern in India and how they influence the quantum and the mode of runoff generation (10) .

3. Answer the following questions
   a. What are the steps involved in the design of the contour bunds? How these parameters can be estimated (10) ?
   b. Classify Bench Terraces and write the conditions under which each type will be suitable (10) .
   c. What are the sheet and nil erosions and how they are harmihi to the agricultural lands (10) ?
   d. Write short notes on:
      i. Remote sensing
      ii. GIS (10)

4. Answer the following questions
   a. What points you will consider while selecting a site for the construction of a farm pond (10) ?
   b. Write short notes on:
      i. Saltation
      ii. Suiface creep in wind erosion (10) .
   c. Write in brief about the Erosion Index and Kinetic Energy of natural rainfall, their utility and measurement (10) .
   d. What is the use of water stage level recorder? Explain the mechanism of Stevens 'F' type stage level recorder (10) .

Section B

1. Answer any four subparts not exceeding 150 words for each subpart
   a. Classify different methods of irrigation stating suitability of each under different situations of crop, water and soil conditions (10) .
   b. What is the Booster Pump? What role does it play in a sprinkler irrigation (10) ?
   c. List out the characteristics of centrifugal pumps (10) .
   d. A prefabricated concrete channel section used for lining an irrigation channel has the following specification: Bottom width 17.5 cm, Top width 20 cm and. Height 17.5 cm. Calculate the carrying capacity of the section when the channel slope is 0,2% . Take the Manning's 'n' as 0.01 (10) .
   e. Write about the suitability of the Parshall flume over Weir as a flow measuring device: (10)

2. Answer the following questions
   a. Write in brief about the management of clogging problems in drip irrigation (10) .

b. What do you understand by the term 'lining of irrigation channels' What is the necessity for lining the irrigation channels? State the different materials used the lining the water course with their relative merits and demerits (10) .

c. Mention four types of irrigation efficiency with expressions to calculate each (10) .

d. What are the requirements of a good storage structure for the scientific storage of foodgrains (10) ?

3. Answer the following questions

a. Draw a neat diagram showing different types of aquifers.Indicate and explain the various types of wells that result from these aquifers (15) .

b. An irrigation stream of 30 liters per second is diverted to a check basin of size 12 m × 10 m. The water holding capacity of the soil is 15% . The average soil moisture content in the root zone prior to applying water is 7% . How long should the irrigation stream be applied in the basin to replenish root zone moisture to its field capacity, assuming no loss, due to deep percolation? The depth of root zone may be assumed 1.0 in. The apparent specific gravity of the soil is 1.5 (15) .

c. What is the function of a foot valve in a centrifugal pump? Mention principal causes of pump troubles with remedies (10) .

4. Answer the following questions

a. Mention different types of tile drainage system with suitable diagram (10) .

b. What is a greenhouse? How does the greenhouse effect occur inside the greenhouse Give some salient features of a computerised control greenhouses (10) .

c. Write a note on the use of plastic pipes for drainage (10) .

d. Write in brief about the utility of pen barns on the dairy farm (10) .

Paper-II

Section A

1. Write short notes, not exceeding 150 words each, on any Four of the following:

a. Radiator Pressure cap (10) .

b. Starting aids used in diesel tractors (l0) .

c. Paddy drum seeder (10) .

d. Savonius wind rotor (10) .

e. Solar photo-voltanic cells (10) .

2. Answer the following questions

a. Draw P-V diagram of an ideal diesel cycle indicating the different events. Mark the swept. Volume and clearance volume in the diagram. Also draw an actual P-V diagram and explain the causes for its deviation from the ideal cycle for a 4-stroke cycle engine (15) .

b. With the help of a diagram, explain the working of a conventional differential as used in the rear wheel driven tractors. What is the function of a differential lock (15) ?

c. Explain with a diagram the working of bypass type lubricating oil filtering system as adopted in modern tractor engines (10) .

3. Answer the following questions

a. Explain the working of a power operated flywheel type forage chaffcutter. How is power transmitted to the feed rolls 7 How do you determine the theoretical capacity of the chaffcutter (15) ?

b. What is producer gas? With a schematic diagram explain the working of a down draft type gasifier (10) .

c. With a neat sketch, explain the working of a tractor mounted hydraulic sprayer. How does a hollow cone nozzle differ from the solid cone nozzle? How do you determine the field capacity of the sprayer (15) ?

4. Answer the following questions

a. If a farmer can hire a 7.5 kW power tiller with operator for ₹ 85 per hour for tilling operation, how many hours per year must he operate to justify the purchase of this power unit? Take initial cost of powertiller with rotavator ₹ 1,20, 000; useful service life 15 years diesel fuel consumption 1 5 liters/hour; and operator's wages ₹ 75 per day. Assume any other data if required (15) .

b. Explain the procedure to select a suitable size of electric motor for running a centrifugal pump for lifting water from shallow well (10) .

c. Draw the sectional view of a fixed dome type biogas plant and show the different components. Calculate the required size of digester for a 3 in3 capacity biogas plant using retention period as 50 days (15) .

Section B

1. Write short notes, not exceeding 150 words each, on an low of the following:

a. Homogeization of milk (10)

b. Extraction of oil from rice bran (10)

c. Strain gauge torque sensor (10)

d. Vapor compression refrigeration system (10) .

e. Computer memory (10) .

2. Answer the following questions

a. Calculate the amount of moisture evaporated from 100 kg of paddy grain from drying it from an initial moisture content of 22 per cent (wet basis) to final morsture content of 14 per cent on wet basis (10) .

b. Explain the working of an absorption type hydraulic dynamometer. How can this dynamnometer be used to measure the brake power of an engine?

c. What are the desirable qualities of packaging materials for foods? Give most commonly used packaging materials, one each for milk, butter, baked foods and tea and write their properties (15) .

3. Answer the following questions

a. What is deep bed drying? Explain with a diagram the process of drying paddy grains using this technique (10) .

b. With a block diagram, explain the generalised data acquisition system. What are the factors that decide the configuration and sub systems of data acquisition system (15) ?

c. What is milk sterilisation? How is it different from pasteurization? With a flow chart, explain the preparation of in-bottle sterilized milk (15) .

4. Answer the following questions

a. Explain the production of milk powder using a spray dryer.Compare the milk prepared from whole milk powder with the fresh milk in terms of shelf life and nutritive value (15) .

b. What are thermocouples? How can it be used to measure the temperature of a hot body? Write two most commonly used materials for thermocouples and give their temperature ranges (15) .

c. Explain the working of a bucket elevator for handling small grains. How do you determine the theoretical power requirement of a bucket elevator (10) ?