AGRICULTURAL UNIVERSITIES OF GUJARAT
COLLEGE OF AGRICULTURAL ENGINEERING AND TECHNOLOGY
JUNAGADH/GODHRA/DEDIYAPADA

Semester: 6th (Supplementary) B.Tech (Agril. Engg.)
Semester End Examination – 2019-20

Subject: Soil & Water Conservation Structures | **Course No.: SWE-304**
Date: 16/12/2019 | **Time: 10.00 to 12.30 hrs.**
Day: Monday | **Marks: 80.00**

Q-1 Select appropriate answer **[10.0]**

i End sill is the down stream part of
- A. Straight drop spillway
- B. Chute spillway
- C. Drop inlet spillway
- D. None of above

ii The conduit of chute spillway is
- A. Open channel
- B. Closed channel
- C. Both a and b
- D. None of above

iii Chute spillways are used at
- A. Mild slope
- B. Steep slope
- C. Both a and b
- D. None of above

iv At down stream section of spillway, the flow velocity is reduced by
- A. Creating hydraulic jump
- B. Smoothly diverting the flow
- C. Both A and B
- D. None of above

v In hydrologic design of gully control structure, we compute
- A. Dimension of structure
- B. Peak discharge rate
- C. Strength of the structure
- D. All above

vi Floor block constructed in stilling basing / apron are helpful to
- A. Create hydraulic jump
- B. Reduce erosion
- C. Dissipate the energy of falling water
- D. A & C

vii Seepage line is also called as
- A. Phreatic line
- B. Saturation line
- C. Both A & B
- D. None of above

viii To make downstream side of embankment safe, the
- A. Seepage line should cut the d/s face
- B. Seepage line should not cut the d/s face
- C. Seepage line should cut the foundation
- D. None of above

ix The position of seepage line is influenced by
- A. Permeability of fill materials
- B. Permeability of foundation materials
- C. Both A & B
- D. None of above

x A best site for pond construction is _____
- A. a depressed spot with clay layer
- B. a depressed spot with sandy layer
- C. a depressed spot with loamy soil
- D. none of above

Q-2 Indicate **True (T)** or **False (F)** for the following statements **[10.0]**

i The formation of hydraulic jump takes place in the down stream section of the drop structure.
ii The conduit of the chute spillway is design as open channel.
iii A dam is water body
iv The flow net is related to seepage analysis in earthen dam.
v In earthen dam of homogeneous soil does not require core wall.
vi The upstream face of earthen dam is an equipotential line.
vii The retaining walls are constructed for making water storage.
viii Farm ponds are constructed for water harvesting.
ix In pond, the emergency spillway is used for releasing the water.
x The pond's design is done for return period of 15 years.

Q.3 Write short notes on **any Five** of the followings: [10]

a) Hydraulilc jump
b) Drop inlet spillway
c) Farm pond
d) Water harvesting
e) Piping
f) Anticeep collar

Q.4 Answer **any Four** of the following questions. [20]

a) Briefly explain the design points of permanent gully control structures.
b) Explain the different components of drop structure with neat sketch
c) Explain various types of earthen embankment with neat sketch
d) Enlist the site selection criteria for farm pond.
e) Define phreatic line and write the procedure to determine the position of phreatic line in case of earthen dam with filter.

Q.5 Solve **any Five** of the following problems. [30]

a) Calculate the best hydraulic rectangular cross section to convey Q=10 m^3/sec discharge with n=0.02 and S=0.0009 canal characteristics.
b) In a rectangular hydraulic channel, the discharge per unit width was recorded as 3.0 m^3/s/m during a hydraulic jump. Determine the sequent depth and energy lost, if the depth of flow before the hydraulic jump is 0.3 m.
c) Estimate the capacity of farm pond using **(i)** Trapezoidal formula and **(ii)** Simpson's formula. The area enclosed by different contours of site is as follows.

Contour value (m)	150	151	152	153	154	155	156
Area enclosed (m^2)	200	250	300	307	405	610	635

d) Design the chute spillway with SAF stilling basin which has to be constructed for conveying the runoff generated from u/s area of 30 ha, into the gully of 4.5 m width with 3.0 m as drop. The other details are as: Rainfall intensity during 50 years return period = 12 cm/h for the duration equal to Tc; Runoff coefficient (C) = 0.35 and a straight inlet with depth of flow as 0.70 m at the outlet.
e) Design a masonary retaining wall of height 6m. The face of the wall in contact with the earth is vertical The earth column is flush with the top of the wall. The density of the masonary is 2200 kg/m^3 and that of the earth is 1700 kg/m^3. The angle of response of the soil is 30°. The coefficient of friction μ is 0.5. The maximum compressive stress of the masonary is 20,000 kg/m^3. Check for stability.
f) To control a narrow gully, design a box-inlet drop structure. The contributing catchment area of gully is 50 ha, the highest rainfall as 125 mm during 30 years return period was recorded. The other details are as follows
   i. Maximum travel length of runoff = 700 m
   ii. Average channel slope = 0.5 %
   iii. Rainfall-intensity-return period relationship is
   $$I = (5.75\ T^{0.156}) / (t + 1.005)^{0.540}$$
   iv. Runoff coefficient = 0.40
   v. B/W = 0.25 and B = 0.50 m,
   vi. $W_e < 2.5$ W

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Semester: 6th (Supplimentary) B.Tech (Agril. Engg.)

Semester End Examination-2019

Subject:	**Drainage Engineering**	**Course No.:**	**SWE-302**
Date:	**17/12/2019**	**Time:**	**10:00 to 12:30**
Day:	**Tuesday**	**Marks:**	**80.00**

Note: Assume necessary data if required.

Answer the following questions

Q.1 Define the term agricultural drainage with objective. Discuss different advantages and disadvantages of it. [10]

Q.2 Elaborate term waterlogging along with its different characteristics. Describe the different causes of water logging with its adverse effect on crop production. [10]

Q.3 Define subsurface drainage system with its objective and benefit. Explain different tile drainage layout with neat sketch. [10]

Q.4 Write assumption and derive Hooghoudt's drain spacing equation for steady state condition with neat sketch. [10]

Q.5 Explain the various term related to drainage: interceptor drains, Relief drains, drainage envelope, hydraulic conductivity, bio drainage and vertical drainage [10]

Q.6 Solve the following problems [10]

(A) Calculate the most efficient bottom width for a drainage channel to carry a flow 2m deep in clay soil. Compute the velocity and discharge of the channel if the channel gradient is 0.04 %.

(B) In the 110 days long rabi cropping season in semi-arid region, the average crop water requirement is 4 mm/day, which is met through surface irrigation at suitable irrigation interval with an application efficiency of 60 %. The EC of irrigation water is 1 dS/m and the ECe of the soil water is 5 dS/m, which is to be reduced to 2 dS/m by leaching. If leaching efficiency 70 %, calculate the leaching requirement.

Q.7 Discuss salt balance, reclamation of saline and alkaline soils with concept of leaching requirement. [10]

Q.8 Solve the following problems [10]

(A) A drainage channel discharges 0.25 cubic meters of water per second and drain 2.5km^2. Calculate the drainage coefficient of this land. If the drainage coefficient is 15 mm, what will be the drain discharge ?

(B) A waterlogged saline land is drained by a sub surface drainage system laid at a spacing of 60 m between the adjacent lateral drain with a lateral length of 200 m. The average discharge of a lateral over 2 month period was 1 lps and average salinity of effluent during this period was 5 dS/m. Calculate the quantity of salt removed per hectare of drained area in two month and the amount of salt removed per hectare-millimeter of water drained.

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Semester End Examination (Supplementary-4th Dean) for 6th Semester B. Tech (Agril. Engg.) of the Academic Year 2019 – 2020

Semester : Sixth
Subject : Drying and Storage Engineering
Course No.: PFE-304

Date: 18/12/2019 (Wednesday)
Time: 10:00 to 12:30 hrs.
Max. Marks : 80.00

Q.1 Define the following terms: **10.0**

a) Dry bulb temperature
b) Fumigation
c) Angle of repose
d) Free moisture content
e) Triple point

Q.2 Differentiate between the following: **20.0**

a) Critical moisture content and Equilibrium moisture content
b) Traditional and modern storage structures
c) Internal and external friction
d) Moisture content on dry and wet basis

Q.3 Answer the following: **20.0**

a) Explain spray dryer in detail with neat and clean sketch.
b) Explain tunnel dryer in detail with neat and clean sketch.
c) Explain the mechanism of food spoilage.
d) Explain Pusa bin with a neat sketch.
e) Explain the moisture migration inside storage bin in winter and summer season.

Q.4 Find the answer of following **10.0**

a) 2500 Kg of paddy with 19% moisture content (wb) is dried to 12% moisture content (db). Calculate (a) the moisture removed during the drying (b) mass of the dried paddy during drying.

b) Determine the value of c and n from the Henderson's equation for the following data obtained under two different conditions of EMC studies of sunflower seed.

Condition	RH, %	Temperature, ℃	EMC, % (db)
1	60	41	10
2	80	53	13

Q.5 Find the answer of following **10.0**

a) What is the role and mechanism of controlled and modified atmospheric storage of various agricultural crops? Explain in detail.

b) Design a bag storage structures for storing 3000 tonnes of wheat. Assume reasonable data where ever necessary.

Q.6 Find the answer of following **10.0**

a) Wheat weighing 950 kg/m^3 is loaded in a circular concrete bin of 30m internal diameter and a clear height of 4m. The angle of internal friction for wheat is 25° and that for wheat and concrete is 24°. Calculate maximum lateral pressure at every 2 m using Airy's theory.

b) A RCC cylindrical grain storage bin has internal diameter of 5 m and is 20 m deep. It is completely filled with paddy weighing 600 kg/m^3. Angle of internal friction for paddy can be taken as 35°, while angle of friction between paddy and bin wall is 30°. Ratio of horizontal and vertical pressure intensity k, is 0.4. Calculate the lateral pressure intensity at 4.0 m, 5.5 m and 18 m depth using Janssen theory.