SRM VALLIAMMAI ENGINEERING COLLEGE

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF AGRICULTURE ENGINEERING

QUESTION BANK

IV SEMESTER

AG 3462 - IRRIGATION AND DRAINAGE ENGINEERING

B.TECH. AGRICULTURAL ENGINEERING

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Prepared by

Mr. R. KARTHICK, Assistant Professor (O.G)/AGRI

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SUBJECT: AG 3462 - IRRIGATION AND DRAINAGE ENGINEERING

SEM / YEAR: IV / II

UNIT I - IRRIGATION REQUIREMENTS			
Pump terminology – selection of pump capacity. Types of pumps and impellers - Priming – cavitation – specific speed –characteristic curves. Turbines – jet assembly – Hydraulic ram. Duty and delta - Rooting characteristics - Moisture use of crop - Evapotranspiration plot - Crop water requirement - Effective rainfall - Scheduling Irrigation requirement - Irrigation frequency, Irrigation efficiencies.			
PART-A			
Q. No	**Questions**	**BT Level**	**Competence**
1.	Define duty.	BT-1	Remember
2.	Define delta.	BT-1	Remember
3.	What are the factors affecting duty?	BT-1	Remember
4.	What is meant by friction loss?	BT-1	Remember
5.	What are the methods for improving duty?	BT-1	Remember
6.	List the types of pumps.	BT-2	Understand
7.	What is Evapotranspiration?	BT-1	Remember
8.	Illustrate the duty, delta and base period relation.	BT-2	Understand
9.	List types of impellers.	BT-2	Understand
10.	What is priming?	BT-1	Remember
11.	Summarize the factors affecting the Evapotranspiration.	BT-2	Understand
12.	What is cavitation?	BT-1	Remember
13.	List the types of characteristic curves in Irrigation.	BT-2	Understand
14.	List the need of Irrigation Scheduling.	BT-2	Understand
15.	Define specific speed.	BT-1	Remember
16.	List the types of turbines.	BT-2	Understand
17.	Illustrate about permanent wilting point.	BT-2	Understand
18.	Define the term irrigation efficiency.	BT-1	Remember
19.	What is Hydraulic ram?	BT-1	Remember
20.	What is the purpose of a jet pump?	BT-1	Remember
21.	Show the types of irrigation efficiencies.	BT-2	Understand
22.	Explain about Evapotranspiration plot.	BT-2	Understand
23.	Explain about rooting characteristics.	BT-2	Understand
24.	Define the term “Irrigation Frequency”	BT-1	Remember

PART-B			
Q.No	**Questions**	**BT Level**	**Competence**
1.	Define the terms of suction head, delivery head, static head, manometric head, total head, Net Positive Suction Head, efficiency of pump.	BT-1	Remember
2.	Explain in detail about the selection of pump capacity.	BT-3	Application
3.	Illustrate about the types of pumps in detail.	BT-3	Application
4.	Explain the types of impeller with neat sketch.	BT-3	Application
5.	A watercourse has a culturable command area of 2600 ha, out of which the intensities of irrigation for perennial sugarcane and rice crops are 20% and 40%, respectively. The Duty for these crops at the head of the watercourse is 750 ha/cumec and 1800 ha/cumec, respectively. Find the discharge required at the head of watercourse if the peak demand is 20% higher than the average requirement.	BT-5	Evaluate
6.	The root zone depth of the crop is 90 cm, and its availability water holding capacity is 15 cm/meter. Irrigation to be applied when 40% available water in the root zone is depleted. If daily consumption use is 3 mm. Find the irrigation period	BT-5	Evaluate
7.	Estimate, after how many days will you supply water to a clay loam soil in order to ensure efficient irrigation of the given crop, if 1. Field capacity of the soil is 25% 2. Permanent wilting point is 12% 3. Density of the soil is 1.65 g/cc 4. Effective depth of root zone is 70cm and 5. Daily consumptive use of water for the given crop is 10mm.	BT-5	Evaluate
8.	The command area of a channel is 3000 hectares. The intensity of the irrigation of a crop is 70%. The crop requires 50 cm of water in 15 days, when the effective rainfall is recorded as 15 cm during that period	BT-5	Evaluate
9.	Interpret the relationship between duty, delta and base period with appropriate explanations.	BT-3	Application
10.	Explain in detail about the types of turbines with neat sketch.	BT-3	Application
11.	Explain the theoretical methods to calculate the Evapotranspiration.	BT-3	Application
12.	Explain detail about factors influencing duty, delta and base period.	BT-3	Application

13.	Write in detail about Irrigation Scheduling.	BT-3	Application
14.	A stream of water of 125 liters/sec was diverted from a canal and 100 liters/sec were delivered to the field. An area of 1.6 hectares was irrigated in 8 hours. The effective depth of root zone was 1.7m. The runoff loss in the field was 420 m^3. The depth of water penetration varied linearly from 1.7m at the head end of the field to 1.1m at the tail end. Available moisture holding capacity of the soil is 20 cm/m depth of soil. Determine the various irrigation efficiency. Irrigation was started at a moisture extraction level of 50% of available moisture.	BT-5	Evaluate
15.	Explain the methods of priming in detail.	BT-3	Application
16.	A stream of water of 100 liters/sec was diverted from a canal and 80 liters/sec were delivered to the field. An area of 1.5 hectares was irrigated in 8 hours. The effective depth of root zone was 1.6m. The runoff loss in the field was 400 m^3. The depth of water penetration varied linearly from 1.6 m at the head end of the field to 1 m at the tail end. Available moisture holding capacity of the soil is 20 cm/m depth of soil. Determine the various irrigation efficiency. Irrigation was started at a moisture extraction level of 50% of available moisture.	BT-5	Evaluate
17.	Explain in detail about the hydraulic ram with neat sketch and also explain about the working principle, advantages and disadvantages.	BT-3	Application

UNIT II - METHODS OF IRRIGATION

Methods of Irrigation - Hydraulics and design - Erodible and non-erodible, Kennedy's and Lacey's theories, Materials for lining water courses and field channel - Underground pipeline irrigation system.

PART-A

Q.No	Questions	BT Level	Competence
1.	What is Micro irrigation?	BT-1	Remember
2.	Where and when the direct irrigation is adopted?	BT-1	Remember
3.	Name a suitable method of irrigation for a hilly terrain. Justify your answer.	BT-1	Remember
4.	Define Net irrigation.	BT-1	Remember
5.	What is meant by contour farming?	BT-1	Remember
6.	Define tank irrigation.	BT-1	Remember
7.	Compare lift and flow irrigation.	BT-2	Understand
8.	Outline the lift irrigation.	BT-2	Understand
9.	Summarize about alignment of canals	BT-2	Understand
10.	Illustrate seepage line irrigation.	BT-2	Understand
11.	Summarize about seepage line irrigation.	BT-2	Understand
12.	Identify the different types of canal lining.	BT-3	Application
13.	Outline about water control structures.	BT-3	Application
14.	What is meant by portable check dams?	BT-3	Application
15.	Differentiate Lacey theory and Kennedy theory.	BT-3	Application
16.	Show the functions of turnouts.	BT-1	Remember
17.	Construct the equation for the pressure variation in irrigation pipe lines.	BT-3	Application
18.	What is Lacey regime	BT-1	Remember
19.	Organize the objectives of canal lining.	BT-3	Application
20.	Develop the condition for Lacey's true regime.	BT-3	Application
21.	What are the purposes of check gates?	BT-1	Remember
22.	What are the objective of culverts in water diversion structures?	BT-1	Remember
23.	Show the components of underground pipeline irrigation system	BT-2	Understand
24.	Illustrate the advantages of canal lining.	BT-2	Understand
25.	Extend the uses of water diversion structures	BT-2	Understand

PART-B

Q.No	Questions	BT Level	Competence
1.	Explain the different types of flooding methods.	BT-1	Remember
2.	Infer the advantages and disadvantages of drip irrigation system.	BT-1	Remember
3.	Evaluate the advantages and disadvantages of Sprinkler System.	BT-1	Remember
4.	Define surface irrigation. Why it is widely practiced method of irrigation? What are the advantages and disadvantages of the method?	BT-2	Understand
5.	Explain in detail about sprinkler method of irrigation and how far it is suitable in Indian conditions.	BT-2	Understand

6.	Write a note on drip irrigation? Identify the components of drip irrigation system.	BT-2	Understand
7.	Using Kennedy theory design an irrigation channel to carry a discharge of 56.63 cumec. Assume N=0.0225 and B/D = 11.3	BT-2	Understand
8.	Design an irrigation channel for the following data using Kennedys theory: Full Supply Discharge = 14.16 cumec Slope, S = 1/5000 Kutters rugosity coefficient, N=0.0225 Critical Velocity ratio , m=1 Side slope, Z= 1/2	BT-5	Evaluate
9.	Design an irrigation Channel in alluvial soil from data using Laceys theory: Discharge = 15 cumec ; Laceys silt factor = 1.0; Side slope = ½:1	BT-5	Evaluate
10.	The slope of an irrigation channel is 0.2 per thousand. Laceys silt factor= 1.0,channel side slope = ½:1.Find the full supply discharge and dimensions of the channel	BT-5	Evaluate
11.	Why should lining be provided in canals? What are the merits and demerits of canal lining?	BT-1	Remember
12.	Demonstrate about types of canal lining.	BT-2	Understand
13.	Illustrate in detail water control and diversion structures.	BT-2	Understand
14.	Organize the components of underground pipeline irrigation system? Explain in detail.	BT-1	Remember
15.	List the pressurized irrigation system.	BT-1	Remember
16.	Summarize a detailed outline on Sprinkler Irrigation and explain its types, Efficiency and Limitations.	BT-2	Understand
17.	Construct the types of irrigation	BT-3	Application

UNIT III - DIVERSION AND IMPOUNDING STRUCTURE

Head works - Weirs and Barrage - Types of impounding structures - Factors affecting location of dams - Forces on a dam - Design of Gravity dams - Earth dams, Arch dams - Spillways - Energy dissipators - Tank Irrigation.

PART-A

Q.No	Questions	BT Level	Competence
1.	What is meant by canal escape?	BT-1	Remember
2.	List the various kinds of dams.	BT-1	Remember
3.	Name the different types of spillways.	BT-1	Remember
4.	What is a weir?	BT-1	Remember
5.	Define tank sluices.	BT-1	Remember
6.	List the forces acting on arch dams	BT-1	Remember
7.	Explain the term sluiceway.	BT-2	Understand
8.	Summarize on spillway.	BT-2	Understand
9.	Classify the types of earthen dams.	BT-2	Understand
10.	Explain barrage.	BT-2	Understand
11.	Illustrate the modes of failure in gravity dams.	BT-2	Understand
12.	Develop the term gravity dam.	BT-3	Application
13.	Dramatize the term stream line.	BT-3	Application
14.	Analyze the limitations of blights creep theory.	BT-3	Application
15.	List the functions of weir.	BT-3	Application
16.	List the uses of dams.	BT-1	Remember
17.	Name the different types of diversion head works.	BT-1	Remember
18.	Compare weir and dam (barrage).	BT-1	Remember
19.	How spillway differs from a sluice?	BT-1	Remember
20.	Estimate the failures that occur during the construction of earth dam.	BT-2	Understand
21.	Define Percolation pond?	BT-1	Remember
22.	Illustrate the functions of scouring sluices.	BT-2	Understand
23.	Identify the component parts of diversion headwork.	BT-3	Application
24.	Construct the purposes of diversion headwork.	BT-3	Application
25.	Explain diversion headwork.	BT-2	Understand

PART-B

Q.No	Questions	BT Level	Competence
1.	Write in detail about the component parts of diversion works.	BT-1	Remember
2.	What are the types of weirs and Explain various components of weir?	BT-1	Remember
3.	Write in detail about the tank surplus works.	BT-1	Remember
4.	What are the causes of failure of Earth dam and Gravity dam? State its remedies.	BT-1	Remember

5.	Summarize the factors affecting the selection of type of a dam.	BT-2	Understand
6.	Give an outline on the causes of Failure in weir on permeable foundation and how to overcome it?	BT-2	Understand
7.	Summarize the criteria for safe design of earth dam.	BT-2	Understand
8.	Explain the forces acting on a gravity dam.	BT-2	Understand
9.	Identify the forces acting on an earth dam.	BT-3	Application
10.	Classify types of dams and list the comparative merits and demerits of various types of dams.	BT-2	Understand
11.	List the various types of spillways and types of gates used in spillways.	BT-1	Remember
12.	Explain in detail about Percolation pond and factors to be considered for a percolation pond.	BT-2	Understand
13.	Explain the features of cross drainage works.	BT-2	Understand
14.	Construct the types of dams and dam arches.	BT-3	Application
15.	List the advantages and disadvantages of Gravity dam.	BT-1	Remember
16.	Show the functions of a under sluice and also list out the design considerations.	BT-2	Understand
17.	The head regulator of a canal has 3 openings each 3 m wide. The water is flowing between the upper and lower gates. The vertical opening of the gate is 1 m. The head on the regulator is 0.45 m (Afflux). If the upstream water level rises by 0.20 m, find how much the upper gates must be lowered to maintain the canal discharge unaltered.	BT-5	Evaluate

UNIT IV - CANAL IRRIGATION AND COMMAND AREA DEVELOPMENT

Classification of canals - Alignment of canals – Design of irrigation canals - Regime theories - Canal Head works - Canal regulators - Canal drops - Cross drainage works Canal Outlet, Escapes - Lining and maintenance of canals - Excess irrigation and waterlogging problem - Command area - Components of Command Area Development Programme - On Farm Development works, Farmer's committee - its role for water distribution and system operation - Rotational irrigation system.

PART-A

Q.No	Questions	BT Level	Competence
1.	What are the classifications of canals based on nature of source of supply?	BT-1	Remember
2.	What are the classifications of canals based on financial aspect?	BT-1	Remember
3.	What are the classifications of canals based on function served by the canal?	BT-1	Remember
4.	Why the canals are aligned?	BT-1	Remember
5.	What are the methods of alignment?	BT-1	Remember
6.	Write any two factors to be considered while aligning the canal.	BT-1	Remember
7.	Illustrate the term cross drainage work.	BT-2	Understand
8.	Summarize about canal head works.	BT-2	Understand
9.	Why training works are provided?	BT-2	Understand
10.	Summarize the advantages of Super passage.	BT-2	Understand
11.	What are the necessities of cross drainage works?	BT-2	Understand
12.	Write the use of alluvial canals.	BT-3	Application
13.	Distinguish between canal Syphon and Syphon aqueduct	BT-3	Application
14.	Define canal escape.	BT-3	Application
15.	What are the problems of water logging?	BT-3	Application
16.	Write about farm development.	BT-1	Remember
17.	Write the objectives of CADP	BT-1	Remember
18.	Illustrate the causes of water logging.	BT-2	Understand
19.	Demonstrate the purpose of water distribution system?	BT-2	Understand
20.	Summarize the components of CADP	BT-2	Understand
21.	Construct on form development work?	BT-3	Application
22.	Identify the objectives of water irrigation association.	BT-3	Application
23.	Organize about Warabandi system of irrigation	BT-3	Application
24.	What is reliability in irrigation?	BT-1	Remember
25.	Summarize why farmers used the water on a rotation system?	BT-2	Understand

PART-B

Q.No	Questions	BT Level	Competence
1.	How canals are generally classified? Describe them briefly.	BT-1	Remember
2.	Explain the various considerations for alignment of a canal.	BT-1	Remember
3.	Why are canal falls necessary? Describe briefly with sketch the various types of canal falls.	BT-1	Remember

4.	What are the types of cross drainage works? Describe them briefly with sketches.	BT-1	Remember
5.	State the factors to be considered for the choice of a suitable type of cross drainage work.	BT-2	Understand
6.	Write about the silt control devices employed in the cross drainage work.	BT-2	Understand
7.	What are the criteria for locating the canal outlet? Explain.	BT-2	Understand
8.	Enumerate the different types of water logging.	BT-2	Understand
9.	Describe in detail about CADP	BT-3	Application
10.	Outline the Role of Water Users Associations in Irrigation Management.	BT-3	Application
11.	Build the benefits from Farmers organization to the stakeholders.	BT-3	Application
12.	Organize the Warabandi system of irrigation with neat sketch	BT-3	Application
13.	How maintenance work carried out in irrigation water supply system.	BT-1	Remember
14.	Explain in detail about canal escape and canal outlet.	BT-2	Understand
15.	Name the advantages and disadvantages of lining of irrigation channels	BT-1	Remember
16.	Design a lined canal to carry 100 m^3 /s on a slope of 1 in 2500. The maximum permissible velocity is 2 m/s, n = 0.013 in Manning's formula and side is 1.25 H : 1.0 V	BT-5	Evaluate
17.	Develop the effects of water logging and also discuss of methods of preventing it.	BT-2	Understand

UNIT V - AGRICULTURAL DRAINAGE

Agricultural drainage - Drainage coefficient; principles of flow through soils, Darcy's law – infiltration theory, Surface drainage systems - Subsurface drainage - Design of subsurface drainage - Pipe materials - mole drains, drainage wells, Leaching requirements - irrigation and drainage water quality - recycling of drainage water for irrigation.

PART-A

Q.No	Questions	BT Level	Competence
1.	Enlist the need for drainage	BT-1	Remember
2.	State the objective of agricultural drainage.	BT-1	Remember
3.	Define deep open drain	BT-1	Remember
4.	What is the inference obtained from drainage coefficient?	BT-1	Remember
5.	What is meant by pipe drain?	BT-1	Remember
6.	Differentiate field drainage and land drainage.	BT-1	Remember
7.	Summarize Darcy Law	BT-2	Understand
8.	How can we control infiltration?	BT-2	Understand
9.	How does infiltration occur?	BT-2	Understand
10.	Outline the factors affecting permeability.	BT-2	Understand
11.	Summarize the different types of surface drainage?	BT-2	Understand
12.	What are the components of surface drainage system?	BT-3	Application
13.	How does surface drainage work?	BT-3	Application
14.	What are the methods of drainage?	BT-3	Application
15.	What are the requirements of drainage system?	BT-3	Application
16.	List the advantages of levees.	BT-1	Remember
17.	Name the design criteria for subsurface drainage systems.	BT-1	Remember
18.	What is the most preferred shape of drainage?	BT-1	Remember
19.	Illustrate the types of drains are constructed in subsurface drainage system.	BT-2	Understand
20.	Summarize the storm water drainage well?	BT-2	Understand
21.	Demonstrate the minimum federal requirements for storm water drainage wells.	BT-2	Understand
22.	Identify the irrigation affect the water quality?	BT-3	Application
23.	Build recycled water be used for agriculture?	BT-3	Application
24.	Show how irrigation differ from drainage?	BT-3	Application
25.	Do moles improve drainage? Justify your comments.	BT-3	Application

PART-B

Q.No	Questions	BT Level	Competence
1.	Derive and explain Darcy's law.	BT-1	Remember
2.	Calculate the ratio of average permeability in horizontal direction to that in the vertical direction for a soil deposit consisting of three Horizontal layers, if the thickness and permeability of second layer are twice of	BT-1	Remember

	those of the first and those of the third layer twice those of second		
3.	Discuss in detail about surface drainage system.	BT-1	Remember
4.	Justify the importance of infiltration theory in agriculture drainage.	BT-1	Remember
5.	Outline the importance of materials for pipe drainage.	BT-2	Understand
6.	Explain in detail about the management of recycled irrigation water.	BT-2	Understand
7.	Elaborate the Structures of Pipe Drainage Systems	BT-2	Understand
8.	How will you design subsurface drainage system?	BT-3	Application
9.	Explain the mole drainage system with neat sketch.	BT-3	Application
10.	How much crop yield increase can be expected from drainage water recycling?	BT-1	Remember
11.	What manner will you check the quality of irrigation water? Justify your comments.	BT-1	Remember
12.	How, why and when to mole drain?	BT-1	Remember
13.	With a neat sketch, Explain how storm water drainage works.	BT-3	Application
14.	Construct the methods in subsurface drainage system with a neat sketch	BT-3	Application
15.	(i) A watershed of 1500 hectares is discharging through a drain at an average ratio of 2.5 m^3/s. Calculate the drainage coefficient. If the drainage coefficient is 3 cm, what would be the discharge through the drain? (6) (ii) List the methods of determining drainage coefficient (7)	BT-1	Remember
16.	List the layout and design of field drains and laterals and explain any two of them?	BT-2	Understand
17.	Calculate LR, total irrigation requirement (I) and leaching percentage (LP) for the following data ECi = 1.2 mmhos/cm, ECdp = 12.0 mmhos/cm (= 2 ´ ECe50% for the crop to be grown), and Ic = 6 mm/day	BT-5	Evaluate