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B.Tech Even Semester (CBCS) Exam., May—2018

AGRICULTURAL ENGINEERING

(6th Semester)

Course No. : AE–605 (C)

[Elective—I (Aquacultural Engineering)]

Full Marks : 75

Pass Marks : 30

Time : 3 hours

Note :
1. Answer **one** question from each unit.
2. Begin each answer in a new page.
3. Answer parts of a question at a place.
4. Assume reasonable data wherever required.
5. The figures in the margin indicate full marks for the questions.

UNIT—I

1. *(a)* Differentiate between open channel flow and pipe flow. Classify the open channel flow based on variation of flow parameters with time and space. 8

(b) A rectangular channel model is used to simulate a prototype channel having the width of 30 m, carrying a discharge of 14 m^3/s at a depth of 25 cm. The model is designed for gravity effect and turbulent flow condition is assumed. Determine the minimum size of the model, discharge and scale ratio, assuming the upper limit of the transitional flow region to be 2000 (R). (Take kinematic viscosity $1 \quad 10^{\ 6}$ m^2/s.) 7

2. *(a)* What do you mean by specific energy and critical flow in open channel? 4

(b) With neat sketch, explain the velocity distribution in open channel and determine the velocity distribution coefficient. 8

(c) Write short notes on the following : 3

(i) Non-prismatic channel

(ii) Hydraulic drop

(iii) Subcritical flow

UNIT—II

3. *(a)* Prepare 100 kg of 5-15-15 fertilizer from ammonium nitrate (35·5%), triple superphosphate (46% P_2O_5) and muriate potash (60% K_2O), and limestone as a filler material. 4

(b) The pH value of five different sections of aquacultural farm was recorded as 6·5, 8·5, 9·0, 9·1 and 9·8. Find out the average pH of aquacultural farm. 3

(c) Describe the factors which can affect the solubility of oxygen in aquacultural pond. 8

4. *(a)* With flow diagram, describe the nitrogen cycle for aquaculture pond. 8

(b) What is liming? Describe the beneficial effect of liming. 7

UNIT—III

5. *(a)* What do you mean by dike? Explain the design consideration of main dike. 10

(b) How the cost of construction of squarish pond is cheaper than the rectangular pond for constant area of pond? 5

6. *(a)* Calculate the total quantity of water require for a semi-intensive shrimp farm as per the details given below : 7

Area of each stocking pond : 2 hectare
No. of stocking pond : 5
Depth of stocking pond : 1 meter

Pond to be refilled : once in 3 days
Mean annual evaporation : $1 m^3/m^2$
Seepage coefficient : 0·001m/day
Culture period : 90 days
Mean annual rainfall : $0·5\ m^3/m^2$
Surface area of feeder canal : $500\ m^2$

(b) Explain the suitability criteria for embankment-type and excavated-type aquaculture ponds. 8

UNIT—IV

7. *(a)* What is aeration? Explain the necessity of aerator in intensive aquaculture pond. 7

(b) Design a pumping unit system for a shrimp farm as per the details given below : 8

Water-holding capacity of each pond : $20000\ m^3$
Number of ponds : 5
Availability of electricity in the area : 5 hours (maximum)
Daily rate of water exchange : 20 percent
Head up to which water is to be lifted : 5 m
Gross efficiency of the pump : 60%

8. *(a)* Draw the schematic diagram of a typical recirculatory aquaculture system. Explain the disadvantages of high-suspended solids load in recirculatory aquaculture system. 7

(b) What are the importances of nitrogen removal unit and UV disinfection unit in recirculatory aquaculture system? 8

UNIT—V

9. What do you mean by hatchery? Explain the different components of commercial carp hatchery. 15

10. Explain the design consideration of fresh water prawn hatchery. 15

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