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B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2013

AGRICULTURAL AND IRRIGATION ENGINEERING

22

VII Semester

AI 9402 - Soil and Water Conservation

(Regulation 2008)

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. What is plasticity index and which value of it is suitable for cultivation practices?
2. Draw the definition sketch to depict the point of failure in soil, in the case of passive state.
3. A spillway crest is located at a height of 4.5m above the floor of the gully. If the gully has a side slope of 6:1, determine the spacing of the temporary structure to be provided to conserve soil and water.
4. Find out the distance of protection offered by a wind break of 18m height. The angle of deviation of the prevailing wind perpendicular to the wind break is 22° . The actual wind velocity is 12.5 kmph at 15m height and minimum wind velocity that is capable of moving the soil fraction is 15kmph at 15m height.
5. Illustrate the effect of width of shelter belt on wind erosion control.
6. How the number of spurs to be provided along an eroded bank is decided upon, if the stream carries a moderate stream flow.
7. Name any four short-term water harvesting structures.
8. Write down any two empirical methods used for the determination of basin yield.
9. State the application of a booster pump.
10. How does the value of the specific speed help one to decide upon the right choice of a pump?

Part – B (5 x 16 = 80 marks)

11. Describe the design procedure that need to be followed in the construction of a dug out farm pond. (16)
 12. a) Following are the 15 observed values of a random variable which constitutes a sample. Find the mean, standard deviation and skewness coefficient of the sample.
1330, 1310, 1420, 615, 548, 1250, 1750, 995, 350, 412, 1048, 190, 535, 213 and 820. Assuming the extreme value distribution as the proper choice to describe the random variable, estimate its parameters and hence find the probability for the variable to exceed 1700. (16)
- (OR)**
- b) (i) Explain the procedure for conducting an undrained triaxial test. (10)
 - (ii) Compare and contrast the drained test and the undrained test with its applications. (6)

13. a) A graded broad-based terrace is to be designed for a land with sandy soil and a surface slope of 8%. Taking into account the soil conditions, it is recommended that the velocity in the terrace channel should be less than 1.5 m/s. The intensity of 1 hr rainfall likely to occur in the area at 10-yr recurrence interval is 7.5 cm/h. The length of the terrace is required to be kept as 300m. Take $C = 0.3$. Design the terrace. (Assume recommended data wherever applicable). (16)

(OR)

- b) Design an inward sloping bench terrace for an area which has sandy loam soil and land slope as 15%. The terrace width acts as channel which is provided with a uniform grade of 0.4%. The maximum rainfall intensity of the area during 10 years return period is 25 cm/hr for the duration equal to the time of concentration. Total length of the terrace bench to be constructed is 150m. Limiting velocity is kept as 60 cm/s. Sketch the terrace. (Assume recommended data wherever applicable). (16)

14. a) (i) Explain the factors affecting wind erosion and its adverse effects. (8)

(ii) Discuss the concept of wind erosion control and explain the vegetative control measures. (8)

(OR)

- b) (i) State the design criteria for the construction of a grassed diversion ditch. (4)
(ii) Design a grassed waterway which is to be constructed as an outlet for a flow from a graded bund system. The expected runoff is $3\text{m}^3/\text{sec}$. The type of grass to be used is Bermuda grass. The slope of the parabolic channel is kept as 3%. (12)

15. a) Describe the working procedure of a submersible pump and draw its characteristic curves. (16)

(OR)

- b) (i) A centrifugal pump 0.06 cumec capacity operates at 1500 rpm against a total head of 22m. If the impellor diameter of the prototype and the model is 0.75m and 0.25m respectively, determine the discharge and head of the model, if the model runs at 3000 rpm; ignoring the efficiency. (6)
(ii) Explain the criteria that warrant the selection of pumps used for irrigating the crops. (10)

Relationship between the land slope and the terrace width of bench terraces

Land Slope (%)	Bench width (m)
10 - 15	4.5 - 6.0
15 - 25	3.0 - 4.5
25 - 33	less than 3

Based on the recommendations of US Soil Conservation Service (1953)

Variable Grades for the Four Parts of the Terrace Channel Length

Terrace Length (m)	Channel Grade starting from the Outlet			
	First 1/4	Second 1/4	Third 1/4	Fourth 1/4
30-120	0.30	0.30	0.20	0.20
121-149	0.35	0.30	0.20	0.20
150-240	0.40	0.30	0.20	0.20
241-359	0.45	0.35	0.25	0.20
>or equal to 360	0.50	0.40	0.30	0.20

Based on the recommendations of US Soil Conservation Service (1953)

Recommended Slopes for Graded Terraces

Land Slope (%)	Vertical Interval (m)	Horizontal Interval (m)
1	0.75	75
2	0.90	45
3	1.05	35
4	1.20	30
5	1.35	27
6	1.50	25
7	1.65	23.7
8	1.80	22.5
9	1.95	21.6
10	2.10	21.0

Based on the recommendations of US Soil Conservation Service (1953)

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>or equal to 360	0.50	0.40	0.30	0.20

Based on the recommendations of US Soil Conservation Service (1953)

Recommended Dimensions for Graded Terraces

Land Slope (%)	Ridge Height at Terrace Length				Recommended Slope Ratio		
	60 cm	120 cm	180 cm	320 cm	Channel-back slope	Ridge front slope	Ridge back slope
2	21	27	30	36	10:1	10:1	10:1
4	21	27	30	33	6:1	8:1	8:1
6	21	24	27	30	4:1	8:1	8:1
8	21	24	27	30	4:1	6:1	6:1
10	18	24	27	30	4:1	6:1	6:1
12	18	24	27	30	4:1	4:1	4:1
14	18	24	27	30	4:1	4:1	9:1

Based on USDA Agri. Handbook - 57

(P.T.O)

