ROLL NO. | | | | | | | | | 31

B.E. / B.Tech. (Full Time) DEGREE ARREAR EXAMINATIONS, APRIL / MAY 2013

AGRICULTURAL ENGINEERING

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. A moist sand sample has a volume of 350 cm^3 and a wet mass of 740 gm. If the particle density is 2.65 g/cm^3 and the dry mass is 700 gm, determine the void ratio.
2. Contextualize passive earth pressure from agriculture point of view.
3. Establish the relationship between shear stress and normal stress in the case of a (a) pure clay (b) pure sand and (c) a moist soil.
4. Prove mathematically how human interference influences soil erosion.
5. Find out the number of spurs required to control water erosion along one side of a stream bank having a length of about 200m. It is given that the total length of the spur is 12m and the angle of projection is 20^0 from the vertical.
6. Differentiate wind break from a shelter belt.
7. The water table levels noted down in two observation wells 250 m apart are +210.5m and 205m respectively. If the hydraulic conductivity and porosity of the aquifer are 12.5 m/day and 18%, find the actual velocity of flow in the aquifer.
8. When does a noise like gravel would be felt in the pump?
9. List out the two types of surface storage structures with examples.
10. Write down any two empirical methods used for the determination of basin yield.

Part – B (5 x 16 = 80 marks)

11. State the different types of water harvesting methods and explain the techniques used in the recharge of groundwater. (16)

12. A) A graded broad-based terrace is to be designed for a land with sandy soil and a surface slope of 12%. Taking into account the soil conditions, it is recommended that the velocity in the terrace channel should be less than 75 cm/s. The intensity of 1 hr rainfall likely to occur in the area at 10-yr recurrence interval is 8 cm/h. The length of the terrace is required to be kept as 300m. Take C = 0.3. Design the terrace. (*Refer tables*) (16)

OR

B) With the help of neat sketches describe the location and purpose of the different types of spillways used as erosion control structures. (16)

13. A) A series of un-drained triaxial tests on samples of saturated soil gave the following results.

Lateral Pressure (KN/m^2)	100	200	300	400
Pressure stress difference at failure (KN/m^2)	290	410	530	680

Find the values of the parameters, cohesion and angle of internal friction analytically or graphically. (16)

OR

B) (i) Describe the procedure for estimating the optimum moisture content of soil using the compaction test. (10)

(ii) Explain the factors affecting soil compaction. (6)

14. A) (i) In a 40 ha catchment, the soil erosion is to be evaluated. The following information for the catchment is available. R = 900 t-m/ha mm/h; K = 0.30 t/ha/R; LS = 0.1; vegetative cover factor = 0.5; Contour farming is practiced in 22 ha (P=0.6) and strip cropping is practiced in the remaining area (P=0.3). (i) Calculate the soil loss using USLE and (ii) Calculate the annual soil loss when no such conservation measure is being taken up. Interpret the values. (8)

(ii) Explain the methods available for the computation of average rainfall over a basin (spatially). (8)

OR

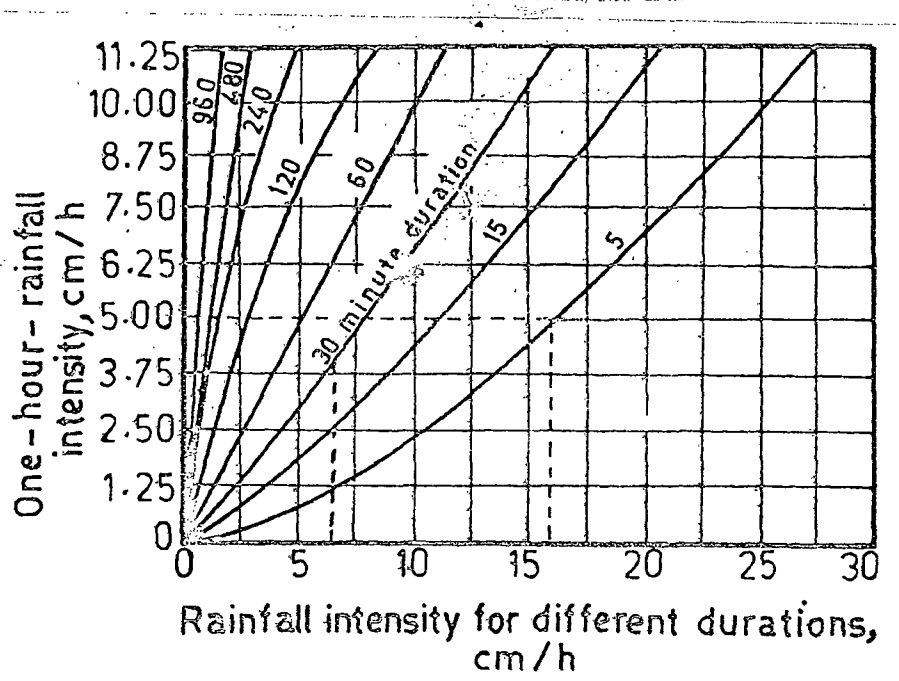
B) (i) Explain the factors affecting wind erosion and its adverse effects. (8)

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

15. A) Explain the working principle of a multi-stage jet pump with a neat sketch, highlighting its advantages and disadvantages. (16)

OR

B) Discuss on the criteria that need to be followed in the selection of a pump that could be used in different agriculture-related activities. (16)



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)

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 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