MAHARASHTRA AGRICULTURAL UNIVERSITY EXAMINATION BOARD, PUNE

SEMISTER END EXAMINATION

B.Sc. (Hons) Agriculture

Semester : II (New)		**Academic Year :** 2018-19	
Course No : ENGG 121 (N)		**Title :** Soil and Water Conservation Engineering	
Credit : 2(1+1)			
Day and Date :		**Time:**	**Total marks :** 40
Note:	**1. Solve ANY EIGHT questions from SECTION "A"**		
	2. All questions from **SECTION "B"** are compulsory.		
	3. All the question carry equal marks		
	4. Draw neat diagrams wherever necessary.		

Model Answers

SECTION "A"

Q1 Write the classification of surveying based on object of survey and nature of field of survey **(4)**

Ans: The classification of surveying is as given below :

1. Nature of Field of Survey:

a) Land Survey
b) Marine Survey or Navigation Surveys
c) Astronomical Survey

2. Object of Survey:

i. Archaeological surveys
ii.Geological Surveys
iii.Mine Surveys
iv.Military Surveys.

Q2 . What is runoff? Explain the climatic factors affecting the runoff **(4)**

Ans: (1 mark for definition and 3 marks for factors)

Runoff may be defined as that portion of the rainfall which makes it way towards the river stream and ocean etc. after satisfying initial losses such as interception, depression storage etc.

Climatic Factors affecting the runoff

(6 factors with short description are expected 1/2mark each)

1) **Types of precipitation**: Precipitation in the form of rainfall start runoff immediately whereas in case of snowfall or hails it does not start immediately
2) **Rainfall Intensity:** When rainfall intensity is greater than infiltration rate of soil, the surface runoff takes place very shortly whereas in case of low intensity of rainfall a reverse trend is found
3) **Duration of the rainfall:** More the duration of rainfall more will be runoff.
4) **Rainfall distribution :** From a given watershed greater the distribution coefficient greater

will be the runoff and vice versa

5) **Direction of the prevailing wind** :A storm moving in direction of stream slope , produces higher peak in short period of time than a storm moving in opposite direction
6) **Other climatic factors:** Climatic factors such as wind velocity, temperature, annual rainfall have a great influence on runoff.

Q3 . Explain the steps (phases) involved in watershed management 4

Ans: **(2 marks for list and 2 marks for description)**

Steps(phases) involved in watershed management are:

1. **Recognition phase:** In this phase various problems of watershed , causes and their alternatives are sorted out by conducting survey and are recognised.
2. **Restoration phase:** This phase involves the selection of best solutions and their applications for watershed management
3. **Protection phase:** In this step general health of watershed is taken care and its normal working is ensured.
4. **Improvement phase:** Under this phase overall improvements made during management of watershed are evaluated for all lands covered.

Q4. a) Write the classification of watershed based on i) Shape ii) Climate

Ans: Classification of watershed based on 2

i) Shape: The most common shapes are 1. Fan Shape and 2.Fern shape
ii) Climate: 1. Humid Watersheds and 2. Arid watershed

Q4. b)

Ans: USLE for soil loss estimation is given as 2

A= R.K.L.S.C.P

Where

A- Soil loss tons/acre/year,
K- Soil erodibility index
L- Slope length, feet
S- Average steepness of slope
C- Crop management factor
P- Conservation Practices factor

Q5. What is rational method for estimation of peak runoff rate and write the assumptions of this method. 4

Ans: Rational method: (2 marks)

The rational method involves following formula for computing the design runoff (Ramser 1972)

Qpeak = 1/360 CIA where

Qpeak- peak runoff rate . m^3/s,

C= runoff coefficient;

I = rainfall intensity (mm/h) for duration equal to the time of concentration of watershed and for a given recurrence interval

A- Watershed area, hectare

Assumptions: (2 marks)

1. Rainfall occurs with a uniform intensity for the duration at least equal to the time of concentration of watershed
2. Rainfall occurs at a uniform intensity throughout the watershed area.

Q6. Explain the different types of strip cropping. **4**

Ans: The following are the types of strip cropping

1) Contour strip cropping: In contour strip cropping, the crops are arranged in the strips or bands on the contour at the right angles to the natural slope of the land. Usually the strips are cropped in definite rotational sequence.

2) Field strip cropping: Field strip cropping consists of the strips of uniform width running generally perpendicular to the direction of the land slope, but not always exactly on the contour. This type of contour strip cropping is frequently used where the topography is either too irregular or undulating.

3) Buffer strip cropping: In buffer strip cropping, the strips of grasses or legumes are laid between contour strips of crops in regular rotation. The width of the strip may or may not be even. They may also be used as correction strips where the slope is irregular.

4) Wind strip cropping: In wind strip cropping system the strip of the crop of uniform width are laid at right angle to the direction of the prevailing winds, without regard of the contour. The main objective of this system is to control wind erosion, rather than water erosion.

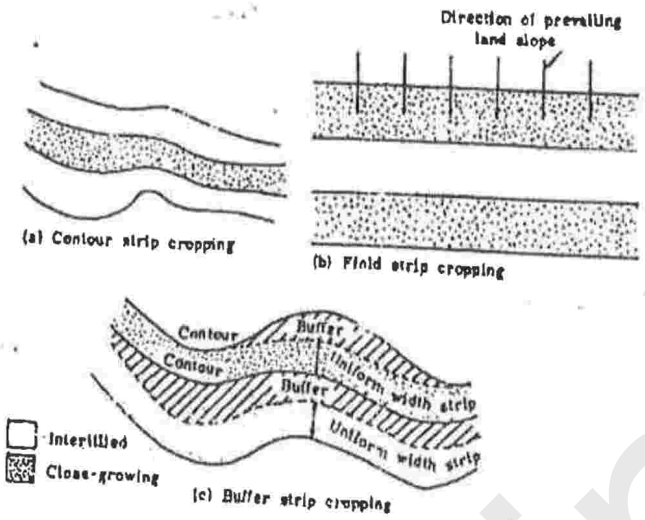

Fig. 14.2. Typical layout for different types of strip cropping.

Q7 Explain the types of soil movement in wind erosion **4**

Answer : After movement is initiated the soil particles are carried in the wind in three types depending on their size in relation to the velocity and turbulence of wind.

Saltation: the major portion of soil is carried by wind is moved in series of bounces or jumps is called salation. The soil particles of size ranging from 0.05 to 0.5 mm usually move in this manner. The direct hit of wind against the soil particles dislodges them from their seats. They move short distance along the surface and then suddenly shoot up in jumping movement.

Suspension: It represents the floating of small sized particles in the air stream. Movement of these particles is initiated by the impact of particles in suspension. Soil particles of size less than 0.05 mm are involved in this type of movement.

They are often carried away many kilometres before being redeposited.

Surface creep: This involves rolling and sliding of large soil particles along the soil surface. The size of soil particles range from 0.5 to 2 mm.

Between 50-75 % soil eroded by wind is carried out by saltation, 3-40 % in suspension and 5-25 % by surface creep

Q8 a) Explain rill erosion in short **2**

Rill erosion is removal of soil by running water with the formation of shallow channels that can be smoothed out completely by normal cultivation. This is more serious in soils having loose shallow topsoil. It may be regarded as transition state between sheet and gullying.

b) Calculate the capacity of farm pond by using trapezoidal formula. The area enclosed by different contours of the farm side is as below: 2

S.No.	Contour value(m)	Area enclosed (Sq.m)
1	300	220
2	301	250
3	302	320
4	303	370
5	304	450
6	305	530
7	306	600
Contour interval (H = 1m)		

Ans:

Trapezoidal formula for Capacity of farm pond

V= H [(Area of first contour + Area of last contour)/2] + Area of remaining contours

V= 1 [(220 +600)/2] + 250 + 320 + 370 + 450 + 530

= 410 + 250 + 320 + 370 + 450 + 530 = 2330 m^3

Q9: Explain the four stages of gully development 4

The four stages of gully development are:

Stage 1 Formation stage, with channel erosion by downward score of the topsoil

Stage 2 Development stage: It consists of upstream movement of gully head and enlargement of gully in width and depth

Stage 3 healing stage: In this stage vegetation begins to grow in the gully.

Stage 4 Stabilization stage: This stage is reached when gully reaches to a stable gradient. The gully walls reach a stable slope and vegetative cover spreads over the gully surface..

During the last two stags the gully head progresses to the upper end of watershed.

Q 10 Write short notes ~~on~~ (any two): 4

a) Time of concentration b) Uses of surveying c) Watershed Evaluation

a) Time of concentration:(Tc) Time of concentration of the watershed is time required for the runoff water to flow from the most remote point of the area to the outlet. When the duration of storm equals the time of concentration, it is assumed that all parts of the watershed are contributing simultaneously to the runoff flow at the outlet. Time of concentration can be obtained by dividing the distance of most remote point from the outlet by dividing the velocity of the runoff flow. It can be also obtained by formula:

$Tc = 0.0195\ L^{0.77}\ S^{-0.385}$

Where Tc is in minutes, L is maximum length of flow, (m) and S is average slope of the area, m/m

b) Uses of surveying: (any four points are expected)

1) The most important object of the surveying is to prepare the maps , plans, diagrams, profile and cross section from the survey data obtained and recorded in the field.

2) To measure and establish lines, distances angles and elevations on the surface of the earth.

3) To determine location, direction, area and volumes of the objects on the earth with the help of these measurement.

4) To do the field work by taking measurements and office work by computing survey data and preparing drawing.

5) To determine the land boundaries and to establish land boundaries of the fields.

6) To design all the engineering and construction projects.

7) To design and execute the soil and water conservation structures

8) To design and execute irrigation and drainage structures

9)To determine the natural features of the country such as hills, valleys, rivers, nallas, lakes etc. and also artificial features such as road railways, canals, building, town and villages

c) Watershed Evaluation :

After implementation of watershed management measures it is required to evaluate the results of the measures. It can be done under following two terms:

1. Achievement of management objectives, viz. Flood control, sediment control, water supply etc.
2. Financial returns, realized.

It is observed that the protective benefits safeguard against misery and losses, which cannot be converted in terms of money, some financial values are taken for them. Financial returns are evaluated in terms of benefit cost ratio.

SECTION "B"

Q.11 Define the following terms.

1) **Geological erosion:** Geological erosion is the erosion of soil under the cover of vegetation. It takes place as a result of action of water, wind, gravity and glaciers.

2) Contour: A contour is an imaginary line of constant elevation on the surface of the ground. Contours are represented on the map by contours lines.

3) Base line: It is the longest chain line which is laid out in the centre of area to be surveyed.

4) **Water harvesting:** Water harvesting is defined as collection of runoff for its productive use. The rainwater may be harvested from roofs ground surface or streams.

12 State true or false

1) True

2) True

3) False

4) True

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