The Open University of Sri Lanka

Faculty of Engineering Technology

Industrial Studies (Agriculture) and Technology (Agricultural Engineering)

Programmes of Study

Final Examination – 2015/2016

AEX4232 - Soil & Water Conservation

Date   : 03/12/2016
Time   : 09.30 a.m. – 12.30 p.m.
Duration   : Three (03) hours

Registration number: ....

Section II – Answer any four (04) out of the six (06) questions. Use answer books and/or sheets to answer this section.

1) i) Briefly explain the major types of run-off.

   ii) A sub-catchment of Kalu Ganga consists of the following vegetation: 77% cultivated crops, 15% pasture, and 8% woodland. Considering the topography as flat and the soil texture as sandy loam, calculate the run-off coefficient at this sub catchment using data from Table 1.

Table 1. Run-off coefficient values in different vegetation

Vegetation	Topography	Sandy Loam	Clay and Silt Loam	Tight Clay
Woodland	Flat	0.10	0.30	0.40
	Rolling	0.25	0.35	0.50
	Hilly	0.30	0.50	0.60
Pasture	Flat	0.10	0.30	0.40
	Rolling	0.16	0.36	0.55
	Hilly	0.22	0.42	0.60
Cultivated	Flat	0.30	0.50	0.60
	Rolling	0.40	0.60	0.70
	Hilly	0.52	0.72	0.82

   ii) If the rainfall intensity is 100 mm/hour and the sub-catchment area is 10 ha, calculate the peak run-off that occurs in the above catchment.

2) A stream flowing at a uniform velocity of 0.5 ms^{-1} carries 287,412 tons of sediments. During the flow, 42,008 tons of sediments are deposited at the stream bed.

   i) Calculate the trap efficiency of the stream.

   ii) If the diameter of sediments is 1.5 mm and the specific gravity of sediments is 2.08, determine whether any bed load movement would occur as stated in the question.

   iii) Discuss the effects of sedimentation in an irrigation channel.

3) i) Using Kennedy's Theory in channel designing, briefly explain how sediments in a channel are kept in suspension.

ii) Water is flowing 0.45 m deep in a 1.2 m wide, open channel of rectangular cross section. The channel is made of concrete, with a constant bottom slope of 0.003. The gravitational force is 9.82 ms^{-2} and the density of water is 1000 kg m^{-3}. Assume the Manning's coefficient of roughness in concrete as 0.011. Calculate the following properties of the channel or the water flow:

   a) Wetted perimeter of the channel
   b) Hydraulic radius
   c) Velocity of water flow in the channel
   d) Flow rate of water in the channel

4) i) Discuss the mechanisms of wind erosion.

ii) Calculate the soil loss in a 5 ha catchment having the following characteristics.

Rainfall erosivity index	= 350
Soil erodibility factor	= 0.17
Field slope	= 3.5%
Slope length	= 280 m
Crop management factor	= 0.57
Conservation practice factor	= 0.48

iii) If soil conservation practices are not carried out for the catchment mentioned in part ii), calculate the soil loss.

5) i) Briefly explain how gullies are developed.

ii) Describe the special structures that assist mechanical conservation of soil in tea lands.

6) i) "Conservation farming techniques assist in improving soils in the long run". Critically discuss the statement giving suitable examples.

ii) Discuss social and agro-environmental benefits achieved through conservation farming.