BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF ENGINEERING AND PHYSICS

PROGRAMME: BSc HONOURS AGRICULTURAL ENGINEERING PART III

AEH306: SOIL AND WATER CONSERVATION ENGINEERING

DURATION: 3 HOURS TOTAL MARKS: 100

INSTRUCTIONS TO CANDIDATES
Answer any FOUR (4) questions. Each question carries 25 marks.

JUN 2024

Question 1

a) Outline the effects of conventional agro-systems on the following:

i. Surface Water Resources [5]

ii. Soil Health [5]

iii. Global warming [5]

b) Design a box-inlet drop structure for a check dam to control gulley erosion from a catchment which has an area of 25 ha. The dam will be constructed from gabion baskets. The average 20-min rainfall intensity for a return period of 20 years for the region is 85 mm/hr where an average of 60% becomes overland flow. [10]

Question 2

a) Suggest the effects and remedies of Aeolian erosion in arable lands [20]

b) Considering a channel depth h of 0.45 m, and for 8-row (0.75-m row width) equipment 6 m wide on 7% land slope, compute the cut and fill heights and the slope ratios for the frontslope and the backslope, assuming a balanced cross section. [5]

Question 3

a) Briefly explain the mechanism of raindrop erosion [5]

b) Distinguish between bench terraces and broad-base terraces [10]

c) Discuss the benefits of grassed waterways as a soil and water conservation tool in arable lands. [10]

Question 4

Contour ridges have been used in many parts of Zimbabwe for soil conservation. In recent times, interest has shifted to their use as water conservation structures in arid areas. Describe and explain the suitability of contour ridges for water conservation purposes in low rainfall areas. [25]

Question 5

a) Describe problems that may arise due to sedimentation [15]

b) Determine the spacing between windbreaks that are 15m high if a 5 -year return period wind velocity at 15m height is 15.6m/sec and the wind deviates 10° from the perpendicular to the field strip. Assume a smooth bare soil surface and a fully protected field. [10]

Question 6

a) Distinguish between rainfall erosivity and runoff erosivity [5]

b) Find the dimensions of an 800m long level broad-base terrace for a land having an average slope of 4%. The maximum expected rainfall having a 10-year recurrence interval is 18cm. The infiltration capacity of the soil of the area is such that 40% of the rainfall is absorbed in the field. The region is sub-humid and has clay loam soils. [20]

END OF QUESTION PAPER!!!