

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF ARCHITECTURE AND QUANTITY SURVEYING

DEPARTMENT OF ARCHITECTURE
BACHELOR OF ARCHITECTURE (HONOURS) DEGREE

PART III - END OF FIRST SEMESTER EXAMINATIONS – DECEMBER 2005
AAR 3103 BUILDING SERVICES

Instructions

Time: 3 hours

Answer all questions.

Use freehand sketches as much as possible in answering the questions.

Question 1

- a) You are required to provide water to St Johns Secondary school near Gaza Business centre in Buhera District. The school is close to a Murove river and lies on an unconfined aquifers whose water level is closer to the ground level. Discuss all necessary steps you should take to come up with the most appropriate source of water for this school [10].
- b) Briefly explain in whom you can incorporate rain water harvesting techniques so as to a the water from your chosen source in (a) above. [7 1/2]
- c) One of the dams that supply the city of Bulawayo with water is Ncema dam. The water that collects in Ncema dam however passes through a region rich in Magnesium, Carbonic and Calcium sulphur. Discuss the problems that might be a around with this water and how best they can be reduced. [7 1/2]

Question 2

- a) Discuss the water purification flow diagram necessary on surface water. [5]
- b) i) Using pension funds, the National Railways of Zimbabwe wishes to build a 48 storey commercial building in Harare. Discuss what you think would be the best way to supply, cold water to this building. [10]
- ii) What do you think could be the disadvantages of the method you have chosen in b(i) above. [5]
- c) During designing cold water supply, the designer should pay attention to back siphonage and how this can be prevented. Explain what back siphonage mean and methods to prevent it. [5]

Question 3

- a) Write brief notes on water storage cisterns. [5]
- b) i) Discuss steps involved in geyser location within a building. [5]
- ii) Briefly explain how hot water can be provided into various draw-off points within a 15 storey hotel. [10]
- c) If the hot water that is to be supplied in the hotel stated in question b(ii) above contains a higher value of hardness than normal, what problems are most likely to be encountered. [5]

Question 4

- a) Calculate the hot-water storage requirement for a factory having a total workforce of 805. The factory has a canteen which prepares main meals for all the workforce. Use tables below for your calculations. [8]

Table 1. Hot-water storage required for restaurant canteen kitchens for 1 ½ hour recovery period.

Number of main meals served	Storage in litres
50	455
100	568
200	682
300	909
400	1137
500 – 600	1364
700 – 800	1818
900 – 1000	2278
1000 and above	2841

Table 2. Provision of hot water storage for ablution purposes.

Type of building	Storage per person
<u>Colleges and schools</u>	
Boarding	
Day	22
	5
Dwelling House	46
Factories	5
Flats	32
<u>Hospitals</u>	
General	28
Infectious	45,5
Maternity	32

- b) By use of the discharge unit value method, find the diameter of a vertical stack to take the discharges from the following sanitary fittings in a 10 storey office block; 120 wcs with 9 litre flush; 120 basins; 20 sinks and 40 winds. Use table 4 and 5 for you calculations.

Table 3

Type of Sanitary fittings	Discharge units
Automatic washing machine	4
WC (9 litre cistern)	15
Washing basin	3
Sink	15
Bath	7
Shower	0,1
Uniral stall or bowl	0,3

Table 4. Maximum number of discharge to be allowed on vertical stacks.

Norminal Internal diameter of pipe (mm)	Discharge
50	10
65	60
75	200
90	350
100	750
125	2 500
150	5 500

- b) Find possible alternatives the diameter and gradient of a horizontal drain to be provided for drainage of the discharge in question 4 (b) above. Use table 5below for your calculations.

Table 5

Internal diameter of pipe (mm)	Fall		
	1m 111	1m 45	1m 22
100	230	430	1 050
125	780	1 500	3 000
150	2 000	3 500	7 500

[7 ½]

Question 5

- a) Discuss i) rain water drainage from roof tops. [4]
 ii) combined drainage method of on a building. [4]

b) Design a septic tank to serve a population of 36 people at Murambinda Secondary School. Assume the following factors.

- Depth of septic tank is 1,5m
- Depth of filter is 1,8m
- Filter to be circular
- Depth of humus tank 1m with a length twice the breadth. [10]

c) What precautions should be taken into conservation when siting the location of the septic tank. [3]

d) Discuss benefits you may get from the septic tank when it is in use. [4]