



**UTHM**

**Universiti Tun Hussein Onn Malaysia**

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
(TAKE-HOME)  
SEMESTER I  
SESSION 2020/2021**

**COURSE NAME : WATER, DRAINAGE AND  
PLUMBING SYSTEM**

**COURSE CODE : BNB 31703**

**PROGRAMME CODE : BNB**

**EXAMINATION DATE : JANUARY / FEBRUARY 2021**

**DURATION : 3 HOURS**

**INSTRUCTION : ANSWERS ALL QUESTIONS  
OPEN BOOK EXAMINATION**

**THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES**

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- Q1** (a) Sime Darby Property would like to develop a mix development area of Pagoh Higher Education Hub consisting of the following premises as shown in **Table Q1(a)** on its 1,000 acres development area.

**Table Q1(a): Types of premises/building and capacity**

<b>Types of Premises/Building</b>	<b>Capacity</b>
Mosque	1,000 person
Stadium	5,000 person
Bus terminal	10 service bay
Institution of higher learning with hostels facilities	10,000 students
Bungalow	500 unit
Double storey terrace house	1,500 unit
Single storey terrace house	3,000 unit
Shop house (double storey)	500 unit
Commercial area	5,000 square metre
Light industrial workshop	200 unit

Based on the **Table Q1(a)** above;

- (i) Determine the total water demand required. (11 marks)
  - (ii) Determine the average flow. (4 marks)
  - (iii) Determine the peak flow. (2 marks)
  - (iv) Determine the fire flow. (3 marks)
  - (b) Most of the available air compressors on the market are multi-staged system. Discuss on this statement. (5 marks)
- Q2** (a) Distinguish between Volute Casing and Vortex Casing in a centrifugal pump. (6 marks)
- (b) A six-storey building with two units house is developed at Pagoh Jaya Town, having two showers, two service basins, one water closet (*1.6 GPF Gravity Tank*), two bidets, one bathtub (*fill valve*) and one kitchen sink on each floor, assuming private use of fittings. The height 6 m (*floor to floor level*) and length of pipe from pump to storage tank is 50 m for given flow rate of 3.41 liters per second at 100% loading unit. The water pressure from the head of pipe equally to 20 psi/fittings. The pipe and valve resistance are 5% and 20% respectively.

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Determine the following:

- (i) Total loading unit and height of the building (5 marks)
- (iii) Pipe resistance, valve resistance, and water pressure from head of the pipe. (3 marks)
- (iii) Total all resistance ( $h$ ). (2 marks)
- (iv) Power of the pump ( $P$ ). (3 marks)
- (c) Explain construction and working of centrifugal pump with help of neat labelled diagram. (6 marks)

**Q3**

- (a) List down **FIVE (5)** types of services that received a direct supply from water mains. (5 marks)
- (b) Discuss the purpose of determining the capacity of a water storage tank based on the daily use. (6 marks)
- (c) With the aid of diagram, briefly outline the complete possible water supply system for a high-rise building. (9 marks)
- (d) Discuss the potential use of greywater and its concept. (5 marks)

**Q4**

- (a) (i) Define Effective Drainage System and give **ONE (1)** example for their application. (3 marks)
- (ii) Drainage systems can be separate for stormwater and sewers but sometimes both these inputs drain into the same underground drainage system. Point out **TWO (2)** advantages of having separate drainage systems. (2 marks)
- (b) (i) Differentiate between Drainage Systems (Gravity) and Vacuum Drainage Systems used for design of plumbing systems for multi-storey buildings. (4 marks)

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- (ii) Identify the comparison of installation and operation requirements both of the systems in **Q2(b)(i)** in terms of maintenance requirements and loading of sewerage system. (4 marks)
- (c) Briefly explain what you understand of the following:
- (i) The sanitation ladder. (2 marks)
- (ii) The waste hierarchy. (2 marks)
- (iii) Rearrange the following into two separate lists, one in the correct order to form the sanitation ladder and the other in the correct order for the waste hierarchy. Categorize the best option at the top of your lists.
- pour flush toilet
  - old cardboard box, flattened out, used as door mat
  - defecating on waste ground
  - broken wooden box used for firewood
  - simple pit latrine with no ventilation or slab
  - refilling a plastic bottle with cooking oil
- (3 marks)
- (d) (i) Identify **TWO (2)** ways in which urbanisation creates challenges for effective sanitation and solid waste management. (3 marks)
- (ii) Elena is a mother of three children aged between 6 months and 5 years. Her husband has a good job and the family are well-off. Elena does most of her shopping in the local supermarket where they give plastic carrier bags to all their customers.
- Employ **TWO (2)** examples of ways Elena could reduce the amount of waste produced by her household. (2 marks)

– END OF QUESTIONS –

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**FINAL EXAMINATION**

SEMESTER / SESSION : SEM I / 2020/2021 PROGRAMME CODE : BNB  
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**Table 1.1: Water Supply Fixture Units (WSFU) and Minimum Fixture Branch Pipe Sizes**

APPLIANCES, APPURTENANCES OR FIXTURES <sup>2</sup>	MINIMUM FIXTURE BRANCH PIPE SIZE <sup>1,4</sup>	PRIVATE	PUBLIC	ASSEMBLY <sup>6</sup>
Bathtub or Combination Bath/Shower (fill)	½	4.0	4.0	
¾" Bathtub Fill Valve	¾	10.0	10.0	
Bidet	½	1.0		
Clothes washer	¼	4.0	4.0	
Dental Unit, cuspidor	½		1.0	
Dishwasher	½	1.5	1.5	
Drinking Fountain or Water Cooler	½	0.5	0.5	0.75
Hose Bibb	¼	2.5	2.5	
Hose Bibb, each additional <sup>8</sup>	½	1.0	1.0	
Lavatory	½	1.0	1.0	1.0
Lawn Sprinkler, each head <sup>5</sup>		1.0	1.0	
Mobile Home, each (minimum) <sup>9</sup>		12.0		
<b>Sinks</b>				
Bar	½	1.0	2.0	
Clinic Faucet	¼		3.0	
Clinic Flushometer Valve with or without faucet	1		8.0	
Kitchen	½	1.5	1.5	
Laundry	½	1.5	1.5	
Service or Mop Basin	½	1.5	3.0	
Washup, each set of faucets	½		2.0	
Shower, per head	½	2.0	2.0	
Urinal, 1.0 GPF Flushometer Valve	¾	See Footnote <sup>7</sup>		
Urinal, greater than 1.0 GPF Flushometer Valve	¾	See Footnote <sup>7</sup>		
Urinal, flush tank	½	2.0	2.0	3.0
Wash Fountain, circular spray	¾		4.0	
Water Closet, 1.6 GPF Gravity Tank	½	2.5	2.5	3.5
Water Closet, 1.6 GPF Flushometer Tank	½	2.5	2.5	3.5
Water Closet, 1.6 GPF Flushometer Valve	1	See Footnote <sup>7</sup>		
Water Closet, greater than 1.6 GPF Gravity Tank	½	3.0	5.5	7.0
Water Closet, greater than 1.6 GPF Flushometer Valve	1	See Footnote <sup>7</sup>		

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