Scanned

THE UNIVERSITY OF ZAMBIA

SCHOOL OF ENGINEERING

2015 FULL COURSES EXAMS

COURSE CODE	COURSE TITLE
1. AEN 4131	FARM STRUCTURES
2. ENG 2139	INTRODUCTION TO INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs)
3. ENG 5129	ENGINEERING MNAGEMENT AND SOCIETY II
4. ENG 4129	ENGINEERING MANAGEMENT AND SOCIETY

THE UNIVERSITY OF ZAMBIA

SCHOOL OF ENGINEERING

2014 -15 ACADEMIC YEAR
MID YEAR FINAL EXAMINATIONS

MARCH 6, 2015

AEN4131 – FARM STRUCTURES

TIME: THREE (3) HOURS

INSTRUCTIONS:

ANSWER: ANY FIVE QUESTIONS

INFORMATION:
1. THIS EXAMINATION PAPER CONTAINS SEVEN QUESTIONS
2. ALL QUESTIONS CARRY 20 MARKS
3. THE MARKS FOR EACH QUESTION ARE GIVEN IN BRACKETS

Question One

a) The choice of materials for building construction can influence a number of aspects on the final structure. List any FOUR aspects that are influenced by the selection of building materials. **(4)**

b) Timber is one of the common building materials used in Zambia. However, its strength is affected by a number of factors. Briefly, state how the strength of timber relates to the following:
   i. Density of timber **(2)**
   ii. Moisture content **(2)**
   iii. Timber species **(2)**

c) In order to protect timber from insect or fungal attack, timber is preserved using three main methods.
   i. Name the THREE main methods of timber preservation. **(3)**
   ii. Which one of the three methods is not suitable when using colourless liquid preservatives? Explain why the method is not suitable for colourless preservatives. **(3)**

d) Earth as a building material has attributes that encourage and facilitate self-help and community participation in house construction. Mention FOUR of these attributes. **(4)**

Question Two

a) Concrete is a very popular construction material due to its high strength, hardness, durability, imperviousness and its ability to be moulded. Apart from pouring and curing aspects, state TWO aspects that greatly influence the strength of concrete. **(2)**

b) A farmer intends to construct walls of a pig pen. His intentions are to mould the blocks on his own and build the super structure using free labour. The farmer needs 1000 blocks to build the pen. The current cement price is K 80 per 50 kg bag and that stones and sand have the same price of K 70 per tonne. The total costs of transporting cement, sand and stones are K 250, K 600 and K 800 respectively. Water for moulding blocks is drawn from a neighbour at a cost of K 10 per 210 litres drum. Given that the volume of a 50 kg bag of cement is 37 litres and that one 50 kg bag of cement can produce 40 blocks determine the following:

i. The number of bags of cement that are to be bought. **(3)**
ii. The number of tonnes of sand to be bought. **(3)**
iii. The number of tonnes of stones to be bought. **(3)**
iv. The total cost of moulding the blocks given that the water – cement ratio is 0.8. **(9)**

Additional information:

The recommended nominal mix is 1:3:6.
Both river sand and stones are completely dry.
Bulk density of sand is 1400 kg/m^3.
Bulk density of stones is 1600 kg/m^3.
Decrease in volume of the mixture and wastage of concrete are already considered in determining the number of block a bag can produce.

Question Three

A beam is subjected to a uniformly varying load which is zero at point D and 20 kN/m at point C. The beam is also used to hoist a weight of 20 kN. The simplified beam and hoist arrangement is shown in Fig. Q3.

i. Determine the supporting reactions on the beam at points A and D . **(4)**
ii. Draw the shear force and bending moment diagrams for the beam. **(12)**
iii. State the maximum values of the shear force and the bending moment and their location. **(4)**

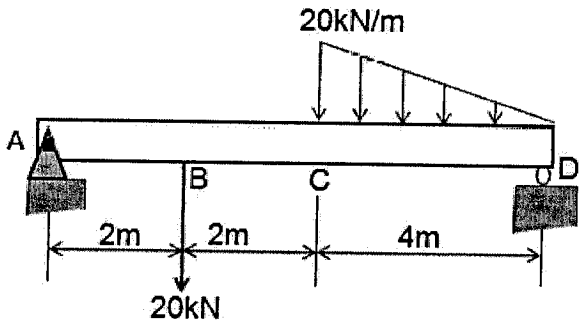

Fig. Q3

Question Four

a) Define the following terms:
   i. Sensible heating **(2)**
   ii. Latent heat **(2)**
   iii. Evaporative cooling **(2)**

b) A farmer's broiler house has 1000 chickens. The evaporation of moisture produced by the birds is dependent on the performance of the ventilation system. Moist air is entering the house at 10 ^{0}C and 70% RH, replacing air removed from the space by an exhaust fan. Air leaves the house at a rate of 5 m^3/s, 25 ^{0}C and 70% RH. Using the Psychrometric Chart, Fig Q4, determine:
   i. The density of air entering the house. **(5)**
   ii. The amount of sensible heat removed from the house per hour. **(3)**
   iii. The amount of latent heat removed from the house per hour. **(3)**
   iv. The moisture removed from the house per hour. **(3)**

Question Five

c) Natural ventilation is the movement of air through specific boundary openings by the use of natural forces produced by wind and temperature differences. List THREE factors upon which natural ventilation depends. **(6)**

d) A 35 m long and 12 m wide farm building has 3.2 m high end walls. The building has a double pitched (gable) roof sloping at 1:5. This naturally ventilated structure has 0.08 m eave openings along the sides, a 0.12 m ridge opening and no ceiling. Determine the ventilation air flow rate in the building due to wind and thermal buoyancy if the outside temperature is 15^0 C, the inside temperature is 31^0 C and the speed of wind, blowing in such a way that one side of the building is the windward and the other is the leeward, is 5 m/s. Take the effectiveness of opening (E) and the reduction factor (μ) values to be 0.35 and 0.63 respectively. Fig. Q5 (a) and Fig. Q5 (b) are provided for use where applicable and acceleration due to gravity (g) is 9.81 m/s^2. **(14)**

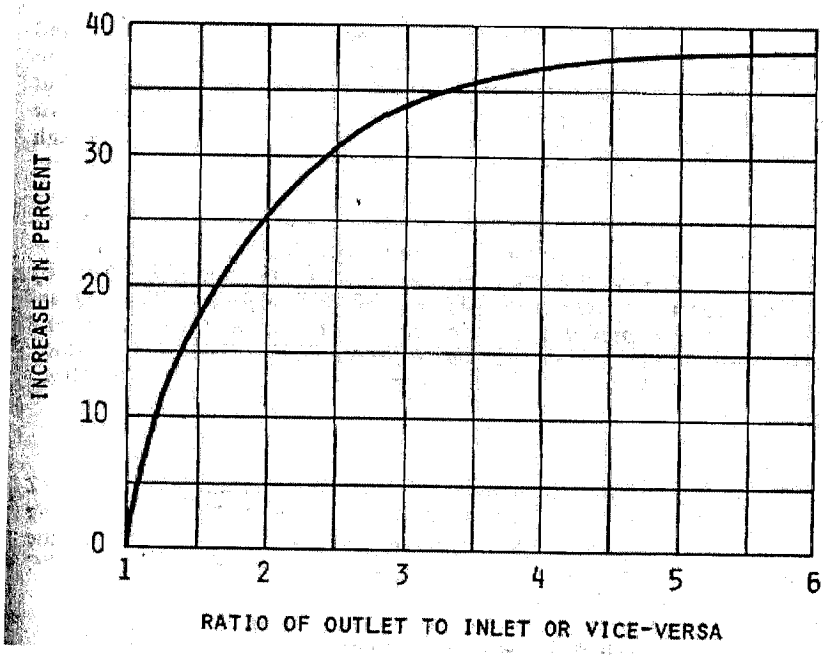

Fig. Q5 (a): Increase of flow rate (Q) due to wind effect when inlet and outlet areas differ

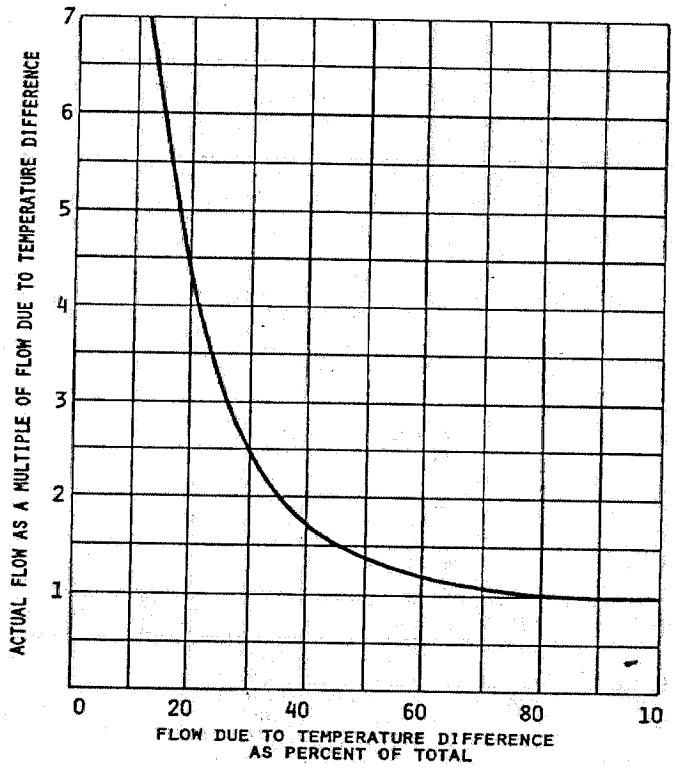

Fig. Q5 (b): Adjustment of combined wind and stack effects flow rate (Q)

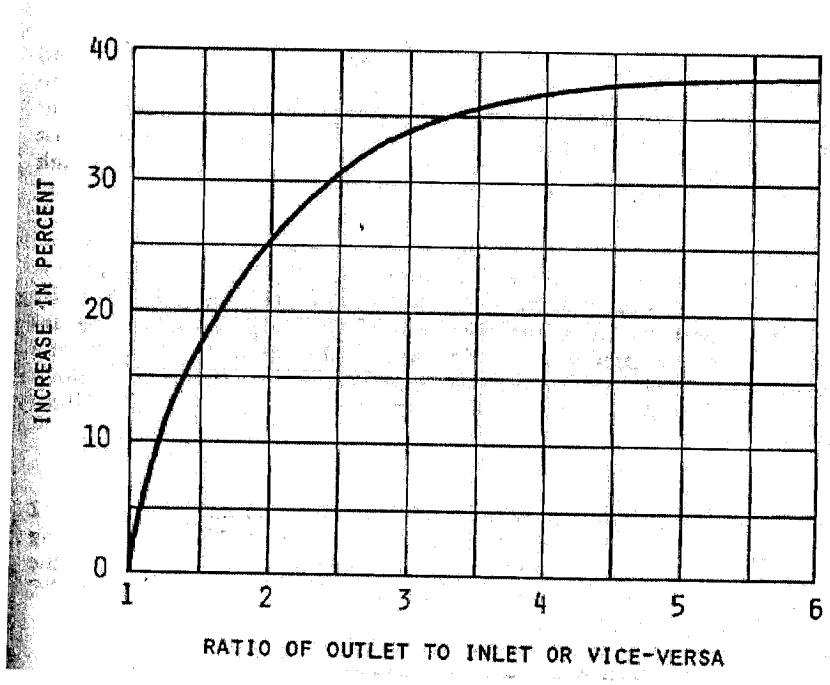

Fig. Q5 (a): Increase of flow rate (Q) due to wind effect when inlet and outlet areas differ

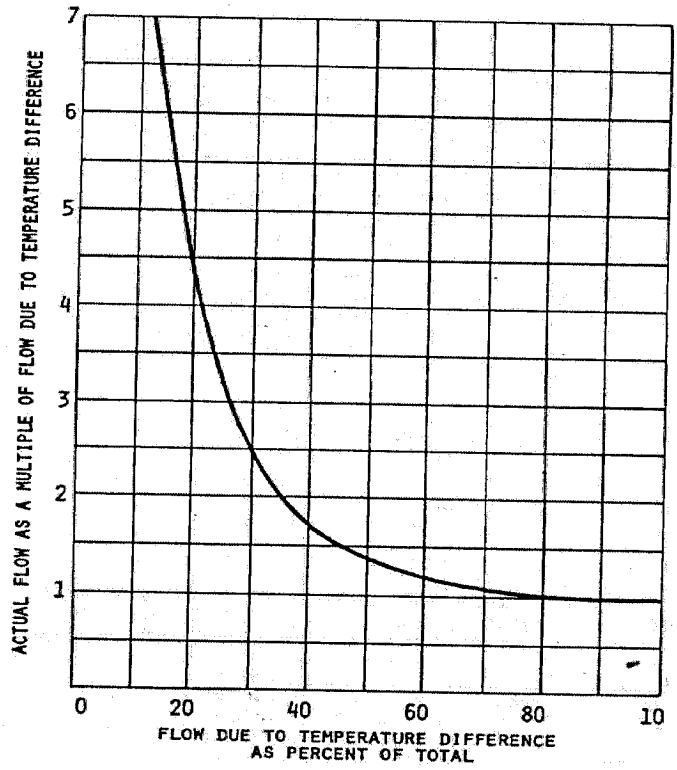

Fig. Q5 (b): Adjustment of combined wind and stack effects flow rate (Q)

Question Six

a) Write short notes explaining how the following climatic factors affect animal productivity:
   i. Temperature (4)
   ii. Relative humidity (4)
   iii. Air movement (4)

b) Write short notes on the following factors that affect the life span of perishable crops:
   i. Temperature (4)
   ii. Relative humidity (4)

Question Seven

a) Mention FOUR functions of ventilation in pig housing. (4)

b) A farmer is running a pig unit with 25 sows. The farmer practices the following in rearing the pigs:
It takes an average of 25 days from weaning to conception. The gestation period for a pig is 3 months, 3 weeks and 3 days but the gestating sow is taken to the farrowing pen 7 days before farrowing. After farrowing, piglets are weaned at 8 weeks but remain in the pen for another 4 weeks. On average, 8 piglets per litter survive to 12 weeks and beyond. The weaners take 5 months to grow and fatten after which the pigs are sold immediately.

Apart from the farrowing pens which house 1 sow per pen, the size of the farmer's other pens is such that a pen can house 8 gestating sows or 10 growing/fattening pigs. After any pen is made empty, it is given 7 days (1 week) for cleaning purposes before it is reoccupied.

Giving your answers to **two decimal places** for part one and to **the nearest whole number** for parts two, three and four with intermediate answers rounded off to **two decimal places**; and taking note that a year has 365 days and a month has on average 30 days; determine the following with respect to the farmer's pig unit:

   i. The number of farrowings per pig per year. (4)
   ii. The number of farrowing pens. (4)
   iii. The number of dry sow/gestating sow pens. (4)
   iv. The number of growing/finishing pens. (4)

SOME USEFUL EQUATIONS

$q = m(h_y - h_x)$

$Q = AU\Delta T$

$\dot{Q}$=EAV

$\dot{Q} = A\mu[2gH(T_i - T_o)/T_i]^{1/2}$

$\tau_{allowable} \geq \tau_{max} = \frac{3V_{Max}}{2A} = \frac{3V_{Max}}{2bd}$

$\sigma_{max} = \frac{Mc}{I}$

END OF EXAMINATION

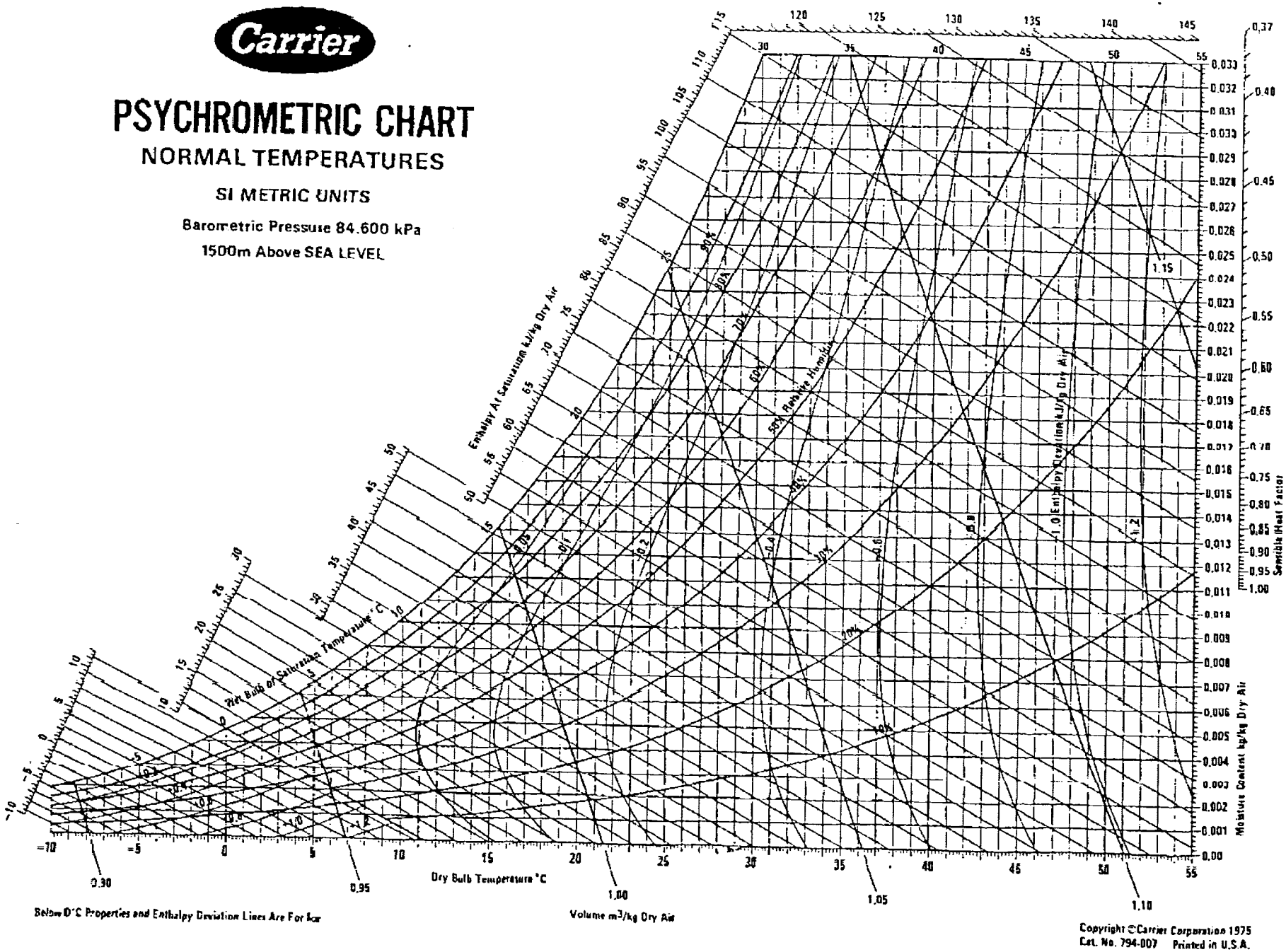
Carrier
PSYCHROMETRIC CHART
NORMAL TEMPERATURES
SI METRIC UNITS
Barometric Pressure 84.600 kPa
1500m Above SEA LEVEL
Enthalpy At Saturation kJ/kg Dry Air
Wet Bulb or Saturation Temperature °C
Dry Bulb Temperature °C
Volume m³/kg Dry Air
Moisture Content kg/kg Dry Air
Sensible Heat Factor
Below 0°C Properties and Enthalpy Deviation Lines Are For Ice
Copyright © Carrier Corporation 1975
Cat. No. 794-007 Printed in U.S.A.

Fig. Q4

THE UNIVERSITY OF ZAMBIA

SCHOOL OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

UNIVERSITY EXAMINATIONS
ENF OF YEAR: June/July 2015

ENG 2139

INTROCUCTION TO INFORMATION & COMMUNICATION TECHNOLOGY (ICT)

TIME	:	**Three (3) hours**
INSTRUCTIONS	:	1. This exam paper has Seven (7) questions, organized in Part I (Question 1a, Question 2 – Question 4) and Part II (Question 1b, Question 5 – Question 7); answers to each part must be written in a ***SEPARATE*** answer sheet. 2. Answer any five (5) questions as follows: a. Question one (1) is ***COMPULSORY***; b. The additional four questions may be chosen freely by the candidate from the remaining six questions. 3. Show clearly all working steps leading to the answer.

PART I

Question One (Compulsory Question)

(a) Draw a diagram depicting a typical computer system as a bottom-up layered model and give a brief description of each of the layers. **[10 marks]**

Question Two

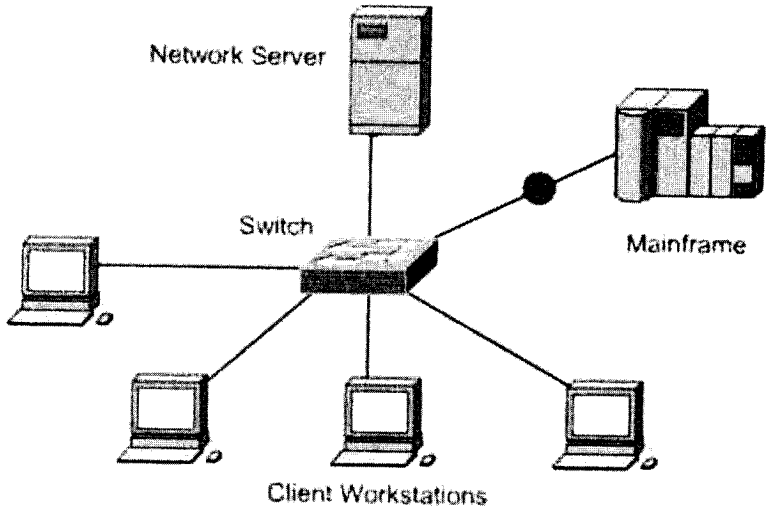

Figure 2-1.: Diagram representing part of a Local Area Network (LAN)

Given that a Local Area Network (LAN) as depicted by Figure 2-1 above, has been recently set up; i.e. the network switch in at the centre of the diagram is brand new. Describe how this network switch will go on establishing its Media Access Control (MAC) Address Table of all devices connected to it. **[20 marks]**

Question three

An Operating System (OS) has many critical functionalities which help users interact in a more meaningful way with the underlying components of a computer system.
List and explain three of those Operating System's functionalities which are more helpful for a developer of applications software. **[20 marks]**

Question Four

(a) Describe key concepts of operating system virtualisation and its two types of deployment. **[5 marks]**
(b) Describe the Instruction Register found in modern computer systems. **[5 marks]**
(c) What do you understand by "Cloud Computing"? **[5 marks]**
(d) In many word processing applications, there are sub-menus such as **"Save"** and **"Save As".** Explain the difference between these two sub-menus. **[5 marks]**

PART II

Question One (Compulsory question)

(b)

i. The nested conditional statement shown below has been written by an inexperienced C/C++ programmer. The behavior of the statement is not correctly represented by the formatting.

```
if (n < 10)
if (n > 0)
cout << "The number is positive." << endl;
else
cout << "The number is _____." << endl;
```

1) What is the output of the statement if the variable n has the value 7

[1 Mark

2) Correct the syntax of the statement so that the logic of the corrected statement corresponds to the formatting of the original statement. Also, replace the blank with an appropriate word or phrase.

[2Marks

3) Correct the formatting of the (original) statement so that the new format reflects the logical behavior of the original statement. Also, replace the blank with an appropriate word or phrase. **[2 Marks**

ii. Write a function named "sum_from_to" that takes two integer arguments, call them "first" and "last", and returns as its value the sum of all the integers between first and last inclusive **[5 marks**

Question Five

(a) Write a function named "eliminate_duplicates" that takes an array of integers in random order and eliminates all the duplicate integers in the array. The function should take two arguments:

I. An array of integers;

II. An integer that tells the number of cells in the array.

III. The function should not return a value, but if any duplicate integers are eliminated, then the function should change the value of the argument that was passed to it so that the new value tells the number of distinct integers in the array.

Here is an example. Suppose the array passed to the function is as shown below, and the integer passed as an argument to the function is 11.

58	26	91	26	70	70	91	58	58	66

Then the function should alter the array so that it looks like this:

58	26	91	70	66	??	??	??	??	??

and it should change the value of the argument so that it is 5 instead of 11 . The question marks in the cells after the 5th cell indicate that it does not matter what numbers are in those cells when the function returns. **[10 Marks]**

(b) Write a function named ***"reduce"*** that takes two positive integer arguments, call them "num" and "denom", treats them as the numerator and denominator of a fraction, and reduces the fraction. That is to say, each of the two arguments will be modified by dividing it by the greatest common divisor of the two integers. The function should return the value 0 (to indicate failure to reduce) if either of the two arguments is zero or negative, and should return the value 1 otherwise. Thus, for example, if m and n have been declared to be integer variables in a program, then

```
m = 25;
n = 15;
if (reduce(m,n))
cout << m << '/' << n << endl;
else
cout << "fraction error" << endl;
```

will produce the following output:

5/3

[10 Marks]

Question Six

(a) Write C++ program to display a table that represents a Pascal triangle of any size. In Pascal triangle, the first and the second rows are set to 1. Each element of the triangle (from the third row downward) is the sum of the element directly above it and the element to the left of the element directly above it.

[10 Marks]

(b) Write a C++ program that will display the calculator menu.

I. The program will prompt the user to choose the operation choice (from 1 to 5). Then it asks the user to input two integer vales for the calculation. See the sample below.

MENU
1. Add
2. Subtract
3. Multiply
4. Divide
5. Modulus

Enter your choice: 1
Enter your two numbers: 12 15
Result: 27

Continue? y

II. The program also asks the user to decide whether he/she wants to continue the operation. If he/she input 'y', the program will prompt the user to choose the operation gain. Otherwise, the program will terminate.

[10 marks]

Question Seven

(a) Write a program which will prompt the user to input the values of a, b, and c. It then computes the real roots of the equation based on the following rules:

- if a and b are zero=> no solution
- if a is zero=>one root (-c/b)
- if b2-4ac is negative=>no roots
- Otherwise=> two roots

The roots can be computed using the following formula:

$$x_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$$x_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

[10 marks]

(b) Write a program that will ask the user to input n positive numbers. The program will terminate if one of those number is not positive using functions

[10 marks]

END

THE UNIVERSITY OF ZAMBIA
SCHOOL OF ENGINEERING

END OF YEAR EXAMINATION – 2015

ENG 4129: ENGINEERING, MANAGEMENT AND SOCIETY

TIME: 3 HOURS

INSTRUCTIONS

- Attempt one question of each section
- All questions carry equal marks

Section A (Economics)

1. (a) Economics has been described as the study of wealth. Discuss the adequacy of this definition, making clear the nature and scope on the subject.

   (b) Explain the importance of the production possibility curve as central to economics and state determinants of shift in the production possibility curve. (Support your answer with graphs)

2. (a) What is meant by the term 'national income'?

   (b) What are the main problems in its calculation with particular reference to its suitability as an indicator of the standard of living?

   (c) Explain, illustrate as appropriate, and give examples of the usefulness of:

      (i) Price elasticity of demand.

      (ii) Income elasticity of demand.

Section B (Industrialization and Technology Development)

3. (a) The industrialization process in developing countries is dependent on that of the developed countries. Show why and how?

   (b) What are various considerations important in the technology transferring process?

4. (a) Critically discuss the extent to which the mining activities in Zambia can lead to the industrialization of the country and justify.

   (b) "Technology transfer is not complete in itself without support of research and development". Do you agree? Why?

Section C (Entrepreneurship and Accounting)

5. (a) Explain entrepreneurship and the characteristics of entrepreneurs.

   (b) Explain the importance of financial information for entrepreneurs.

   (c) Explain the key financial statements in new ventures (enterprises).

6. (a) On 1 July Tembo starts in business with capital of K1,500.00 which he banks. He then buys by cheque a market stall, K125.00; goods for resale, K234.00; and equipment K112.50. His transactions are as follows) (ignore VAT)

   - 2 July cash sales K136.00. Purchase goods for resale K68.00. Wages of assistant in cash K10.00.

   - 3 July cash sales K242.00. Purchase of goods for resale K126.50 cash. Electric light connection fee K12.00 cash. Tip to dustman K1.00 cash.

   - 4 July cash sales K193.00. Purchases in cash of goods for resale K121.50. Wages of assistant K10.00.

   - 5 July cash sales K284.00. Purchases by cheque of goods for resale K116.50. Wages of assistants K20.00 cash. Banked K250.00.

   - 6 July cash sales K262.50. Wages of assistants K20.00 cash. Tembo takes K100.00 from cash box as personal drawings.

     (i) Record the above items. Extract a Trial Balance as at 6 July and from it prepare a Trading Account and Profit and Loss Account for the week and a Balance Sheet as at that date. Stock at the close was valued at K117.50. Wages are to be charged in the Profit and Loss Account.

   (b) What is a business plan? And identify the benefits of a business plan (i) for an entrepreneur (ii) for financial sources.

END OF EXAMINATION

THE UNIVERISTY OF ZAMBIA

SCHOOL OF ANGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

ENG 5129 ENGINEERING MANAGEMENT AND SOCIETY II

FINAL EXAMINATION JULY 2015

Time: Three (3) Hours Closed Book

Instructions

1. Answer any FIVE (5) Questions;
2. State all assumptions, and comment as much as possible on the implications of the answer obtained;
3. Draw neat graphs and sketches where necessary;
4. Work with algebraic expressions as afar as possible before final computations;
5. Use metric units, where possible, in all your computations;
6. All solutions must be written in a legible handwriting and or manner, otherwise the solution/s will attract no marks;
7. Tie or staple the answer script/s in the left-hand corner; and
8. Each question carries Twenty (20) marks.

Allowable materials:

a) Non-Programmable Calculator;
b) Steam tables, and
c) Graph paper.

* All University of Zambia Examination Rules Apply

Question 1

(a) Planning has 5 main advantages. Name 5 advantages of planning. **(4 marks)**
(b) Planning is said to be a process comprising of 6 steps, describe the steps. **(6 marks)**
(c) Name the three duties of planners? **(6 marks)**
(d) In use of resources, managers are required to possess 2 qualities. Discuss these two (2) qualities. **(4 marks)**

Question 2

(a) Discuss the difference between strategic planning and tactical planning. **(6 marks)**
(b) Explain how the many roles of the Chief Executive Officer (CEO) relate to his/her roles as organizational planner? **(4 marks)**
(c) State and discuss components involved in the three environmental levels analysis in strategic planning. **(5 marks)**
(d) Corporate governance essentially involves balancing the interests of the many stakeholders in a company. Name any 5 stakeholders that you know. **(5 marks)**

Question 3

(a) What are the 4 marketing mix. Briefly explain them. **(4 marks)**

(b) Explain the role of a job description for **(i)** employer, **(ii)** employee? **(4 marks)**
(c) Highlight the major elements of strategy management process used in establishing organizational direction. **(4 marks)**
(d) State and briefly describe the two main areas to consider when managing Human Resource if they are to work effectively. **(4 marks)**
(e) Explain the importance why personnel specifications should be prepared when planning recruitment? **(4 marks)**

Question 4

The activities, their durations and precedence of a research project are shown in Table Q1. Draw a network diagram for the project and calculate the fastest time in which the operation might be completed.

TableQ1 Research project activities

Activity	Preceding activity	Estimate in month
START		
D	START	0
A	START	4
F	D,A	7
E	D	8
G	F,E	5
B	F	5
H	G	7
C	H	8
END	C,B	0

(12 marks)

b) To shorten the length of the project the sponsor has offered to remove the work of activity E from the project making activity D the predecessor to activities G and F. What will be the effect? **(8 marks)**

Question 5

You are the head of the project selection team at Zam Roots records. Your team is considering three different recording projects. Based on past history, Zam Roots expects at least a rate of return of 20 percent. Your financial advisors predict inflation to remain at 6 percent into the foreseeable future. Given the following information for each project, which one should be Zam Roots first priority? Should Zam Roots fund any of the other projects? If so, what should be the order of priority based on return on investment?

Recording Project: **Katyetye**

Year	Investment	Revenue Stream
0	K 600,000	
1		600,000
2		75,000
3		20,000
4		15,000
5		10,000

Recording Project: **Chilimwibala**

Year	Investment	Revenue Stream
0	K 400,000	0
1		400,000
2		100,000
3		25,000
4		20,000
5		10,000

Recording Project: **Lelo Ni Lelo**

Year	Investment	Revenue Stream
0	K 200,000	0
1		200,000
2		125,000
3		75,000
4		20,000
5		10,000

(20 marks)

Question 6

Discuss 5 key qualifications for an Arbitrator required to mediate a purported contractual dispute between UNZA and a company hired to fully upgrade the water and sewerage network at the Great East Road Campus. The dispute is centered on non-adherence to technical specifications in the contract on the quality of the piping material and delays in project completion. **(20 marks)**

Question 7

(a) Explain in detail what you understand by the term "Cost of Quality". **(5 marks)**

(b) What are the three types of quality costs? Explain each one of them in detail by giving several examples. **(15 marks)**

End of ENG 5129 Examination 2015

Prepared by S Tembo (Dr.), I N Banda (Dr.), J M Chileshe (Dr.), and N J Kwendakwema (Dr.).

School of Engineering, The University of Zambia.