QUESTION 1

At a selling price of GHC3.80 per unit, the expected sales of a particular product would be GHC10,200, but would fall to GHC8,400 if the selling price was GHC4.70. The total cost function (GHC) for the product is 15000 + 1.8x where x is the number of units.

Required:

(a) Derive the demand function, assuming it is linear. (***6 marks***)

(b) Derive an expression for total profit. (***6 marks***)

(c) Calculate the maximum profit and the level of sales at which the maximum is attained. (***6 marks***)

(d) What price is charged per unit at the maximum profit point? (***2 marks***)

(**Total: 20 marks**)

QUESTION 2

(a) Consider which of the relationships below are likely to have a positive and which are likely to have a negative correlation coefficient.

(i) The distance a vehicle travels and the fuel consumed.

(ii) The demand for laptop computers and their price.

(iii) The average temperature of countries in the tropics and sales of warm clothing.

(iv) The population of countries and the amount of electricity used.

(v) The amount consumers spend on motor insurance and their age.

(vi) The income of people and the amount of income tax they pay.

(vii) The fuel consumption of cars and their engine capacity. (***4 marks***)

(b) Outstanding balances on the monthly bills of nine credit card accounts and the household income of the account holders are:

Balance (GHC)	250	1630	970	2190	410	830	0	550	0
Income (GHC 000)	15	23	26	28	31	35	37	38	42

Required:

(i) Plot these figures in a scatter diagram with outstanding balance as the dependent variable. (***4 marks***)

(ii) Calculate the Pearson correlation coefficient and comment on its value. (***6 marks***)

(iii) Calculate the Spearman's Rank correlation coefficient and comment on its value. (***6 marks***)

(**Total**: **20 marks**)

QUESTION 3

(a) Briefly explain the following terms in Project Network Analysis:

(i) Critical path (***1 mark***)

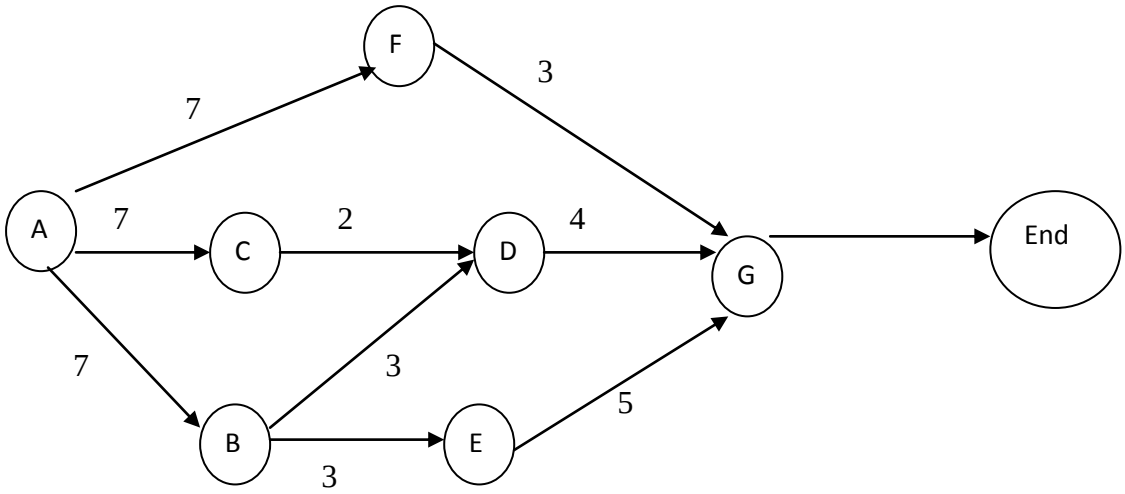
(ii) Critical activity (***1 mark***)

(iii) Project duration (***1 mark***)

(iv) Activity duration (***1 mark***)

(v) Total float (***1 mark***)

(b) The network for a small building project for Kukuomu Challets Limited is shown below, together with the time, in days, required to complete each task.



Required:

(i) List the possible paths through the network and the length of the path (in days) in each case. (***4 marks***)

(ii) State the critical path and the project duration. (***2 marks***)

(iii) Calculate the total float for each activity. (***5 marks***)

(iv) If activity D → G takes 8 days, rather than 4, explain by how many days, if at all, the project would be delayed.
(***4 marks***)

(**Total: 20 marks**)

QUESTION 4

(a) Asembi Company estimates that it will have to replace a piece of equipment at a cost of GHC800,000 in 5 years. To have the money in 5 years, a sinking fund is established by making a monthly equal payment into an account paying 6.6% nominal interest rate compounded monthly.

Required:

(i) Calculate how much each payment should be. (***4 marks***)

(ii) Calculate how much interest is earned during the last year. (***8 marks***)

(b) Mr. Asempa deposits GHC2,000 annually into an Individual Retirement Account (IRA) that earns 6.85% interest compounded annually. Due to a change in employment, these deposits stopped after 10 years, but the account continues to earn interest until Mr. Asempa retires in 25 years after last deposit was made.

Required:

Calculate how much will be in the account when Mr. Asempa retires. (***8 marks***)

(**Total: 20 marks**)

QUESTION 5

(a) Hanson is about to install a new machine for making parts for domestic appliances. Three suppliers have made bids to supply the machine.

The first supplier offers the Basicor Machine which automatically produces parts of acceptable size, but not outstanding quality. The output from the machine varies (depending on the materials used and a variety of settings) and might be 1,000 a week (with Probability of 0.1), 2,000 a week (with Probability of 0.7) or 3,000 a week. The profit for this machine is GHC4 a unit.

The second supplier offers a superstamp machine which makes higher quality parts. The output from this might be 700 a week (with Probability of 0.4) or 1,000 a week, with a profit of GHC10 a unit.

The third supplier offers the switchover machine, which managers can set to produce either 1,300 high-quality parts a week at a profit of GHC6 a unit, or 1,600 medium-quality parts a week with a profit of GHC5 a unit.

If the machine produces 2,000 or more units a week, Hanson can export all production as a single bulk order. Then there is 9.60% chance of selling this order for 50% more profit and a 40% chance of selling for 50% less profit.

Required:

(i) Draw a decision tree to illustrate Hanson's decision-making problem (***5 marks***)

(ii) Calculate the expected monetary value (EMV) at each decision node (***8 marks***)

(iii) Advise Hanson on the best course of action. (***1 mark***)

(b) Ntamapa sells two styles of suit called standard and super. Each suit contains a jacket, trousers and waistcoat. The following table shows the selling price of each part of a suit.

Style	Selling price (GHC) Part		
	Jacket	Trousers	Waistcoat
Standard	4	6	8
Super	12	16	20

Three companies; Drobo, Keto and Zuu place regular orders for their employees. The following table shows the number of suits (demand) ordered in one week.

Company	Standard	Super
Drobo	10	80
Keto	40	30
Zuu	20	60

Required:

Use matrix multiplication to find:

(i) The income from each company (***2 marks***)

(ii) The amount each company spent (***2 marks***)

(iii) The total income of Ntamapa (***2 marks***)

(**Total: 20 marks**)

QUESTION 6

For a certain group of constituencies, it was observed that 70% of the Male Members of Parliament (MPs) were succeeded by Males and 30% by Females. Also, 40% of the Female MPs were succeeded by Males and 60% by Females.

Required:

(i) Set up the 2 x 2 stochastic matrix with columns and rows labelled M and F which displays these transitions (***4 marks***)

(ii) Compute A^2 and A^3 (***8 marks***)

(iii) Suppose that all the current MPs are Males. Assuming that the current trend holds for three elections what percent of the MPs will then be Males?

(***8 marks***)

(**Total: 20 marks**)

QUESTION 7

The annual income for randomly selected secretaries recorded in thousands of cedis are as follows:

9.6	9.7	7.6	10.0	9.4	8.9	10.2	7.7	7.1	9.1
10.4	14.3	5.2	11.0	8.8	10.5	8.1	8.0	9.2	12.1
11.1	10.3	8.4	10.1	12.4	9.7	11.2	9.3	8.9	12.2

Required:

(i) Obtain a grouped frequency distribution for the data using the Sturges Rule. (***6 marks***)

(ii) Compute the coefficient of variation of annual income of the secretaries (***6 marks***)

(iii) Compute the coefficient of skewness and kurtosis (***8 marks***)

(**Total: 20 marks**)