QUESTION 1

The marks obtained by 10 students in two courses, Business Management and Economics, are given below:

Student	1	2	3	4	5	6	7	8	9	10
Business Management	50	56	70	64	62	72	58	76	68	64
Economics	57	62	65	55	48	48	42	40	45	52

Required:

{a} Compute Pearson's coefficient of linear correlation between the courses.

(6 marks)

{b} Calculate Spearman's coefficient of rank correlation between the courses.

(6 marks)

{c} Determine, how many marks you expect a student to obtain in Economics, if he obtained 60 marks in Business Management.

(6 marks)

{d} Comment on your results in (a) and (b).

(2 marks)

(Total: 20 marks)

QUESTION 2

{a} State and explain two (2) types of inventory control systems.

(4 marks)

{b} FATAMA FOODS is a restaurant in Navrongo that provides meals to its customers. The company buys special ingredient, Dawadawa, at 10 pesewas (GH¢0.10) a ball from a local producer. The restaurant uses 24,500 balls of Dawadawa each year. It costs 20 pesewas (GH¢0.20) to place an order and the unit holding cost per year is considered to be 20 percent of the value stored.

Required:

{i} Using Economic Order Quantity Model (EOQ) determine how many balls the restaurant should purchase at a time.

(4 marks)

{ii} Calculate the Total Annual inventory cost to the restaurant.

(4 marks)

{iii} Calculate the inventory cycle of the restaurant. (2 marks)

{iv} Determine whether the company should accept an offer of a 2 percent discount on the balls if they are purchased quarterly.

(6 marks)

(Total: 20 marks)

QUESTION 3

{a} Myown Financial classifies shares in the energy sector as low, medium or high risk. In recent years these have had mean annual returns of 9.2%, 17.0% and 14.8% respectively. The standard deviations have been 3.9%, 9.8% and 13.6% respectively.

Required:

Using a suitable measure of spread, choose the share class with the highest return.

(4 marks)

{b} The crowd for a Unity Games might be small (with a probability of 0.4) or large. The organisers can pay a consultant to collect and analyse advance ticket sales a week before the event takes place. The advanced sales can be classified as high, average or low with probability of advanced sales conditional on crowd size given by the following table:

Crowd Size	**Advanced Sales**		
	High	**Average**	**low**
Large	0.7	0.3	0.0
Small	0.2	0.2	0.6

The organisers must choose one of the two plans in running the event. The table below gives the net profit (in thousands of GH¢) for each combination of plan and crowd size:

Crowd Size	Plan	
	Plan 1	**Plan 2**
Large	20	28
Small	18	10

Required:

{i} Draw a decision tree for the problem of planning the Unity Games.

(7 marks)

{ii} Calculate the expected monetary value of each decision node.

(7 marks)

{iii} Advise the organisers of the Unity Games on the best decision to maximize expected profit.

(2 marks)

(Total: 20 marks)

QUESTION 4

A group of physical fitness devotees works out in the gym every day. The workouts vary from strenuous, to moderate to light. When their exercise routine was recorded, the following observation was made:

Of the people who work out strenuously on a particular day, 40% will work out strenuously on the next day and 60% will work out moderately. Of the people who work out moderately on a particular day, 50% will work out strenuously and 50% will work out lightly on the next day.

Of the people working out lightly on a particular day, 30% will work out strenuously on the next day, 20% moderately and 50% lightly.

Required:

{i} Set up the 3 X 3 stochastic matrix with columns and rows labeled S, M and L which describes these transitions.

{ii} Suppose that on a particular Monday 80% have a strenuous, 10% a moderate, and 10% a light workout, what percentage will have a moderate workout on Tuesday?

{iii} From (ii), what percentage will have a strenuous workout on Wednesday?

(Total: 20 marks)

QUESTION 5

{a} Explain the following terms in Linear Programming:

i. Primal Problem
ii. Dual Problem
iii. Shadow Prices

(3 marks)

{b} Give the two main uses of the shadow price (in linear programming) to management.

(2 marks)

{c} A chemical manufacturer processes two chemicals Arkon and Zenon in varying proportions to produce three products A, B, and C. He wishes to produce at least 150 units of A, 200 units of B and 60 units of C. Each ton of Arkon yields 3 of A, 5 of B and 3 of C. Each ton of Zenon yields 5 of A, 5 of B and1 of C.

If Arkon costs GH¢40 per ton and Zenon GH¢50 per ton, and the final simplex tableau for the dual formulation of the Problem is given by:

Final simplex Tableau

Solution Variable	**A**	**B**	**C**	**Slack Variable**		**Cost**
B	O	1	6/5	-3/10	-3/10	5
A	1	O	-1	-1/2	+1/2	5
Quantity	O	O	-30	-25	-15	-1,750

Required:

{i} Formulate the primal problem. (2 marks)

{ii} Formulate the dual problem. (2 marks)

{iii} construct an initial simplex tableau for the dual problem. (2 marks)

{iv} Perform the first interaction of the initial simplex tableau. (3 marks)

{v} Interpret the final simplex tableau. (6 marks)

(Total: 20 marks)

QUESTION 6

The purchase department of Dabi Company has analysed the number of orders placed by each of the 5 departments in the company by type for this financial year. The table below illustrates the orders placed.

ORDER TYPE	**DEPARTMENT**					
	sales	**Purchase**	**Production**	**Accounts**	**Maintenance**	**Total**
Consumables	10	12	4	8	4	38
Equipment	1	3	9	1	1	15
Specials	0	0	4	1	2	7
Total	**11**	**15**	**17**	**10**	**7**	**60**

An error has been found in one of these orders.

Required:

{a} Calculate the probability that the incorrect order:

i. was for Consumables. (1½ marks)

ii. was not from Consumables (2 marks)

iii. came from Maintenance (1½ marks)

iv. came from Production (1½ marks)

v. came from Maintenance or Production (2 marks)

vi. came from neither Maintenance nor Production (2 marks)

vii. was an equipment order from Purchase (1½ marks)

{b} The following is the probability distribution of possible profits from two projects A and B.

Project A

Probability	Profit (GH¢)
0.6	4,000
0.4	8,000

Project B

Probability	Profit (GH¢)
0.2	2,000
0.3	2,500
0.3	4,000
0.1	8,000
0.1	12,000

Required:

i. Determine the expected profit from each of the projects. (6 marks)

ii. State your choice. (2 marks)

(Total: 20 marks)

QUESTION 7

{a} Give four examples of financial time series. (4 marks)

{b} The sales of a particular travel guide have been recorded at a website as follows:

Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2011	80	122	130	77
2012	82	118	129	82
2013	83	120	130	-

Required:

i. Draw the graph of the data and comment on any observed trend or pattern. (4 marks)

ii. Calculate a centred four-quarter moving average trend and show this on your graph. (6 marks)

iii. Using the estimates in (ii) above, predict sales made through the website for the 1st and 2nd quarters of 2014. (6 marks)

(Total: 20 marks)