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**University Examinations 2014/2015**

THIRD YEAR, SPECIAL /SUPPLEMENTARY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

**BIT 2212: BUSINESS SYSTEMS MODELLING**

**DATE: OCTOBER, 2015 TIME:** $2 $**HOURS**

**INSTRUCTIONS:** *Answer questions* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE - (30 MARKS)**

1. KK Ltd has a cost of capital of 10% and is considering which project or projects it should initiate. The following projects are being considered.

|  |  |
| --- | --- |
| Projects | Estimate cash flows |
| Year 0 | Year 1 | Year 2 | Year 3 | Year 4 |
| A | -15000 | -25000 | 30,000 | 30,000 | 20,000 |
| B | -25000 | -15000 | 30,000 | 29,000 | 30,000 |
| C | - 35000 | -5000 | 40,000 | 44,000 | 30,000 |

Capital is limited to £40,000 now and £ 35,000 in year 1. The projects are divisible. Formulate the information as an L.P problem. (8 Marks)

1. What are the assumptions of the critical path method(c.p.m) (3 Marks)
2. The normal time of an activity is 12days at a cost of £48$°$ and a crash time of 8 days at $£$ 640. Calculate the cost slope of the activity. (4 Marks)
3. What are the objectives of inventory control? (4 Marks)
4. What are the benefits of queuing theory. (3 Marks)
5. A manufacturer has to supply his customers with 1200 units of his product per annum. The inventory carrying cost amounts to £1.2 per unit. The set up cost per run is £160. Find
6. EOQ (Economic Order Quantity) (2 Marks)
7. Minimum average yearly cost (2 Marks)
8. Optimum number of orders per year. (2 Marks)
9. The optimum time between orders (optimum period of supply per optimum order)

(2 Marks)

**QUESTION TWO (20 MARKS)**

1. Highlight the characteristics of business system modeling. (5 Marks)
2. What is your take on the term business system modeling? (2 Marks)
3. ( i ) Maximize

 z = 9y1+10y2

Subject to;

$y\_{1}$+$2y\_{2}\leq 8$

5$y\_{1}+2y\_{2}\leq 16$

$$y\_{1}\geq 0,y\_{2}\geq 0$$

Using the simplex technique.

Using the simplex technique

(ii) What is your interpretation of the variable added to the model above. (12 Marks)

1. An officer needs to purchase new filing cabinets. Ace cabinets costs £40 each and require 6 square feet of floor space and 8 cubic feet of files. On the other hand each excello cabinet cost £80 and requires 8 square feet of floor space and holds 12 cubic feet of files. His budget permits him to spend no more than £560 on files, while the office has room for no more than 72 square feet of cabinets. The manager desires the greatest storage capacity within the limitations imposed by funds and space. If he uses the two types, how many of each type of cabinets should he buy? (6 Marks)

**QUESTION THREE (20 MARKS)**

1. Calculate the cost slopes and the critical path of the following network. (6 Marks)

|  |  |  |  |
| --- | --- | --- | --- |
| Activity | Preceding Activity | Time | Cost |
| Normal | Crash | Normal | Crash |
| 1 | - | 5 | 3 | 500 | 620 |
| 2 | - | 4 | 2 | 300 | 370 |
| 3 | 1 | 7 | 6 | 650 | 680 |
| 4 | 1 | 3 | 2 | 400 | 450 |
| 5 | 2,3 | 5 | 3 | 850 | 1000 |

1. Define the following words as used in business system modeling. (6 Marks)
2. Optimistic time
3. Pessimistic time
4. Most likely time
5. The annual demand per item is 6400 units. The units cost is £12 and the inventory carrying charges 25% per annum. If the cost of procurement is £300 determine;
6. EOQ
7. No of orders per year
8. Time between 2 consecutive orders
9. Optimal cost (8 Marks)

**QUESTION FOUR (20 MARKS**)

1. What are the rules for constructing a network diagram. ?????
2. Write short notes on the following terms used in business system modeling (6 Marks)
3. Latest start time (LST)
4. Earliest Start Time (EST)
5. Earliest finish Time(EFT)
6. Latest Finish Time (LFT)
7. Critical path
8. Slack variables
9. What are the limitation of the linear programming approach in solving problem(4 Marks)
10. At a currency exchange bureau on average a customer arrives every 5 minutes and takes 4 minutes to be served. Considering the assumptions of a single channel queuing model, determine. (4 Marks)
11. Average number of arrivals per unit minutes
12. Service rate ($μ)$
13. The traffic intensity
14. The probability that the cashier is busy

**QUESTION FIVE (20 MARKS)**

1. A firm has developed a new product c. They can either test the market or abandon the project. Testing the market costs £ 50,000; and likely outcome are favourable with probability of 0.7 and failure with probability of 0.3. If favourable, they could either abandon or produce it when demand is anticipated to b;

Low Probability (p) = 0.25 Loss = £100,000

Medium Probability (p) = 0.6 Profit = £ 150,000

High Probability (p) = 0.15 Profit = £450,000

If the test market indicates failure the project would be abandoned. Abandonment at any stage results in a gain of £30,000 from the special machinery used. Draw the decision tree showing the nodes and probabilities and evaluate the decision tree. (6 Marks)

1. A manufacturer is to market a new fertilizer which is to be a mixture of two ingredients A and B. The properties of the two ingredients are;

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Bone Meal | Nitrogen | Time | Phosphates  | Cost/kg |
| Ingredients A B | 20%40% | 30%10% | 40%45% | 10%5% | 1.20.8 |

In addition it has been decided that;

1. The fertilizer will be sold in bags containing 100kg.
2. It must contain at least 15% nitrogen
3. It must contain at least 25% Bone meal.

The manufacturer wishes to meet the above requirements at the minimum cost possible. Use a graph to solve the problem. (6 Marks)

1. The following data represents sales data for seven years taken at yearly basis.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Year  | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Sales | 14 | 17 | 15 | 23 | 18 | 22 | 27 |

1. Using least square method fit a regression for the data. (6 Marks)
2. Use the fitted regression line to forecast the sales at the 8th year. (2 Marks)