

RFID: - The use of Radio waves to read and capture info. stored on a tag attached to an object

BIT 410/CSC412

SECTION A (COMPULSORY)

Question 1 (30 Marks)

- Define the following term **mobile computing** and state the advantages of mobile computing. (4 Marks)
 - Saves time.
 - Location flexibility.
 - Entertainment.
 - Improved decision making.
 - Ease of Research.
 - Improved customer relation.
 - Enhanced productivity.
- Describe the following technologies used in mobile data communication. (2 Marks)
 - Circuit switching - implies that data from one user (sender) is sent into packets. (2 Marks)
 - Packet switching - it involves splitting the message to be sent into packets. Each packet contains information about the sender, the receiver, the position of the packet in the message and part of the message. (2 Marks)
- What is RFID? Describe two applications of active RFID. (4 Marks)
- What is WiMax and how is it different from Wi-Fi? (4 Marks)
- Explain IEEE 802.11 standard. (4 Marks)
- Explain push and pull service in SMS. (4 Marks)
- Clearly distinguish Narrowband from Spread spectrum. (4 Marks)

SECTION B

Question 2 (20 Marks)

- Explain GPRS functional architecture and application. (10 Marks)
- State the limitations of GPRS. (5 Marks)
 - Limited Radio Resources.
 - Speeds much lower in reality.
- Briefly discuss CDMA technology. (5 Marks)
 - Suboptimal Modulation.
 - No support to Mobile terminated calls.
 - Network Delays.
 - No Store and forward.

Question 3 (20 Marks)

- Discuss the types of satellites based on orbital classifications. (10 Marks)
- Discuss in detail localization, calling and handover in GSM. (10 Marks)

Question 4 (20 Marks)

- What is MANET? Explain routing in MANET. (10 Marks)
- Explain the concept behind techniques like tunneling, reverse tunneling and encapsulation in mobile IP. (10 Marks)

Question 5 (20 Marks)

- What is piconet? What is scatternet? Explain how they form in Bluetooth radio technology? (10 marks)
- List merits and demerits of Bluetooth. (4 Marks)
- Explain the different ways of implementing security in Wireless LAN networks. (6 Marks)

Question ONE

- a) Define Operations Research 2mks
 b) i) List 3 applications of operations research 8mks
 ii) List 5 tools used in operations research 8mks
 c) A company is involved in the production of two items (X and Y). The resources need to produce X and Y are twofold, namely machine time for automatic processing and craftsman time for hand finishing. The table below gives the number of minutes required for each item:

	Machine time	Craftsman time
Item X	13	20
Item Y	19	29

The company has 40 hours of machine time available in the next working week but only 35 hours of craftsman time. Machine time is costed at sh.10 per hour worked and craftsman time is costed at sh.2 per hour worked. The revenue received for each item produced (all production is sold) is sh.20 for X and sh.30 for Y. The company has a specific contract to produce 10 items of X per week for a particular customer. Formulate the problem of deciding how much to produce per week as a linear program.

- d) Answer the questions related to the model below:

$$\text{maximize } 3x_1 + 2x_2$$

$$\text{subject to } 2x_1 + 2x_2 \leq 5$$

$$2x_1 + x_2 \leq 4$$

$$x_1 + 2x_2 \leq 4$$

$$x_1, x_2 \geq 0$$

- i) Use the simplex algorithm to find the optimal solution to the model.
 ii) Find the dual of the model.

Question TWO

Kenya National swimming team coach is putting together a relay team for the 400 meter relay. Each swimmer must swim 100 meters of breaststroke, backstroke, butterfly, or free style. The coach believes that each swimmer will attain the times (seconds) given in the Table below. To minimize the team's time for the race, assign each swimmer for a stroke.

	Free	Breast	Fly	Back
Onyango	54	51		53
Kamau	50	53		52
Wafula	56	54		56

20mks

Question THREE

- a) Explain any 3 limitations of operation search 6mks

b) The data below table 1, is a record of defective Iron sheets per batch of 19 sheets

No of defective batches	0	1	2	3	4	5
No of batches	4	30	15	7	5	3

Table 1

Calculate the probability that a batch selected at random will have

i) 0 defect

ii) At least 2 defects 6mks

3 c) Four factories (M, N, P, Q) supply the requirement of 3 warehouses (X, Y, Z).

The availability of the factories, the requirements of the warehouse and the unit transportation cost are presented in table 3.

Factory	Warehouse			Available
	X	Y	Z	
M	10	8	9	15
N	5	2	3	20
P	6	7	4	30
Q	7	6	8	35
Required	25	26	49	100

Find an initial basic solution of the transportation problem using Minimum Matrix method 8mks

Question FOUR

Use simplex algorithm to solve the following problem.

Minimize: $5x_1 + 2x_2 + 4x_3$

Subject to: $3x_1 + x_2 + 2x_3 \leq 4$

$6x_1 + 3x_2 + 5x_3 \leq 10$

$x_1, x_2, x_3 \geq 0$

20mks

Question FIVE

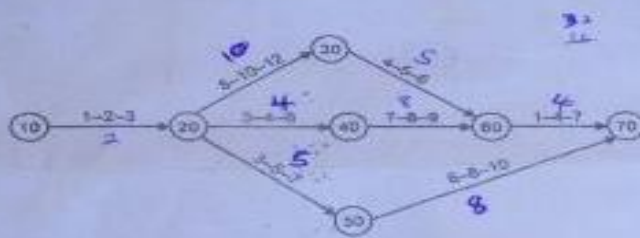
Q 5 a) Explain critical path, slack, dummy activity 6mks

5 b) Construct the network for the following activity data: 6mks

Activity	Preceded by	Activity	Preceded by
A	-	H	F
B	-	I	H
C	B	J	I
D	A	K	D, E, G, J
E	C	L	I
F	C	M	K, L
G	F		

5 c) Consider the PERT network given in fig. below

Determine the float of each activity and identify the critical path if the scheduled completion time for the project is 20 weeks.



8mks

- Define operations research
 - State 3 limitations of operations research
- a transportation problem has 2 origins and 3 destinations. the unit costs of transportations, availability at the origins and the requirements at the destinations are given below

	DESTINATIONS			AVAILABLE
ORIGINS				
S1	9	8	1	30
S2	1	7	8	30
REQUIREMENTS	20	20	20	60

Using minimum matrix method, find the minimum transportation cost.

- A sales manager has to assign salesmen to four territories. he has four candidates of varying experiences and capabilities and assesses the possible trip cost in suitable units for each salesman in each territory as shown below

	territory			
salesmen	T1	T2	T3	T4
S1	25	27	28	37
S2	28	34	29	40
S3	35	24	32	33
S4	24	32	25	28

Find out the assignment that minimizes the total cost of trips

Handwritten calculations for the assignment problem:

37
27
12

35
24
11

32
25
7

40
28
12

b) The data below table 1, is a record of defective iron sheets per batch of 19 sheets

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Required	25	26	49	100

Find an initial basic solution of the transportation problem using Minimum Matrix method 8mks

Question FOUR

Use simplex algorithm to solve the following problem.

Minimize: $5x_1 + 2x_2 + 4x_3$

Subject to: $3x_1 + x_2 + 2x_3 \leq 4$

$6x_1 + 3x_2 + 5x_3 \leq 10$
 $x_1, x_2, x_3 \geq 0$

maximize

Key column most -ve

Key row check = less/smallest +

20mks

minimize

Key column most -ve

Key row Highest of check

Question FIVE

Q 5 a) Explain critical path, slack, dummy activity. 6mks

5 b) Construct the network for the following activity data: 6mks

Earliest start time → The earliest time to which an activity can be started
 Latest finish time → The earliest time to which an activity can be completed without lengthening the minimum project duration.

4mks

No. of TVs demanded	1	2	3	4	5	6	7
No of days	5	15	20	30	18	19	3

Find the probability that demand is 4 TVs or less.

10mks

Q4 a) Differentiate between unbalanced and balanced assignment problem

4mks

b) A job shop has 4 men on four separate jobs. Only one job can work on any one job.

The cost of assigning each man to each job is shown in table shown in table V, assign jobs to each man to minimize the total cost of doing the jobs.

		JOBS			
		1	2	3	4
MEN	A	20	25	22	28
	B	15	18	23	17
	C	19	17	21	24
	D	25	23	24	24

9mks

c) Using graphical method maximize the objective function

$$5x + 10y \quad \text{subject to: } x + 4y \leq 8, \quad 2x + 2y \leq 10, \quad x, y \geq 0$$

7mks

Q5 a) Define i) Critical path of a project ii) Dummy variable iii) slack time

6mks

b) find the expected time of completion of an activity with most optimistic time of 3 days, most pessimistic time of 6 days and most likely time of 4 days

2mks

c) The chief surveyor of a firm that moves earth for road construction has identified the activities and their duration for each stage of the operation. Find how long the project will take and the critical path using the table VI (n.b draw network diagram for the project activities)

activity	duration	Preceding activities
A	5	-
B	10	-
C	1	-
D	8	B
E	10	B
F	9	B
G	3	A,D
H	7	A,D
I	4	F
J	3	F
K	5	C,J
L	8	H,E,I,K
M	4	C,J

2mks

B	18	33	9	31
C	41	25	24	21
D	23	30	28	14

4 b) Find the optimum solution to the following transportation problem.

Form	Destinations						Available
	U	V	W	X	Y		
I	3	4	6	8	8		20
II	2	10	1	40	30		30
III	7	11	20	5	15		15
IV	2	1	9	14	18		13
Required	40	6	8	18	6		

(10marks)

Q5 a) In project management explain

- Critical path,
- Slack
- Free float
- Dummy activity

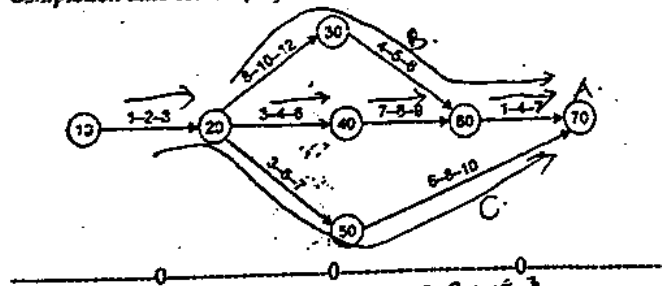
(8marks)

b). Construct the network for the following activity data.

(8 marks)

Activity	Preceded	Activity	Preceded
A	-	I	F
B	-	J	H
C	B	K	I
D	A	L	D, E, G, J
E	C	M	I
F	C		K, L
G	F		

3c). Consider the PERT network given in fig 1, identify the critical path if the scheduled completion time for the project is 20 weeks. (4 marks)



$$\text{Expected time} = \frac{t_o + 4t_m + t_p}{6} = \frac{3 + 4 \times 4 + 7}{6} = \frac{24}{6} = 4$$

$$\frac{1}{5} \times \frac{3}{16} = \frac{3}{80} = \frac{7+3}{80} = \frac{10}{80} = \frac{1}{8}$$

$$\frac{5}{10} = \frac{1}{2}$$

$$\frac{1}{10} = \frac{1}{10}$$

$$\frac{1}{5} \times \frac{1}{2} = \frac{1}{10}$$

$$248, + -24$$

$$\frac{14}{20} = \frac{7}{10}$$

$$\frac{13}{20} = \frac{13}{20}$$

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- Q1 a) Give any 2 definitions of operations research. (4 marks)
 b) State one advantage and three limitations of operations research (8 marks)
 c) Define Earliest Start Time, Latest finish time, slack duration of a project activity (4 marks)
 d) Differentiate between balanced and unbalanced transportation problem (4 marks)

b) The products P, Q and R are produced in three machine processes A, B, C. Each product involves operation of each of the machine centres. The time required for each operation for unit amount of each product is given below.
 100, 77 and 80 hours are available at machine A, B, C respectively. The profit per unit of P, Q, R is Kshs. 24, 6 and 2 respectively.

Table 2

Product	Machine centre			Profit per hour
	A	B	C	
P	10	7	2	24
Q	2	3	4	6
R	1	2	1	2
Available hours	100	77	80	

Using simplex method find suitable product mix to maximize the profit.

(10 marks)

- Q2 a) List 4 limitations of linear programming models (5 marks)
 b) Explain why not all linear programming problems can be solved graphically (5 marks)
 c) A truck can carry a total of 10 tons of product. 3 types of products are available for transportation their weight and values are tabulated. Assuming that at least one of each types must be transported determine the loading which will maximize the total value.

Type	Value (Ksh)	Weight (tons)
A	200	1
B	500	2
C	600	2

(10 marks)

- Q3 a) Explain probabilistic (or stochastic) model in operations research. (4 marks)
 b) The data below table 2 is a record of defective sufurias per batch of 19 sufurias.

Table 2

No of defective	0	1	2	3	4	5
No of batches	40	30	15	7	5	3

Calculate the probability that a batch selected at random will have

- i) 0 defect (5 marks)
 ii) At least 2 defects (5 marks)
 c) List phase of operation research problem solving (6 marks)

- Q4 a) Solve the following assignment problem assignment using minimum matrix method

Workers	Jobs			
	1	2	3	4
A	12	30	21	15

(10 marks)