DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY

UNIVERSITY EXAMINATIONS AY 2019/2020

EXAMINATION FOR DEGREE OF
MASTERS OF SCIENCE IN GEOTHERMAL ENERGY TECHNOLOGY

GET 3011: OPERATIONS AND PROJECT MANAGEMENT

DATE:30/9/2020   **TIME:** 9AM-12PM

INSTRUCTIONS

1. Attempt **THREE** questions

Question 1: (20Mks)

a)   Briefly explain what operation management entail. Further, outline, with an example, **three** areas where Operation management can provide competitive advantage to a firm. **(3Mks)**

b)   State why it is important to know the critical path of a project and discuss the different ways the critical path may be used in network analysis and project planning. **(4Mks).**

c)   A Geothermal development project in the North Rift involves activities whose details are given in Table below.

  (i) Construct an activity on arc network to represent the project.   **(4 Mks)**

  (ii) Calculate the earliest start, latest start, earliest finish and latest finish times for each activity, and the minimum project completion time. **(4 Mks)**

  (iii) Determine the total float associated with each of the non-critical activities.**(3 marks)**

  (iv) State the effect, if any, of delaying activity D by 3 weeks. **(2 Mks)**

Activity	Time (Weeks)	Immediate predecessors
Obtaining Licences (A)	3	
Sourcing and hiring consultants (B)	5	A
Resource Mobilization (C)	1	A
Land acquisition and site development (D)	4	B, C
Preparing design specifications (E)	3	B
Transport of machinery to site (F)	3	E, D
Erection of machinery (G)	2	F
Testing and commissioning (H)	4	E, D

Question 2: (20Mks)

a) Define the concept of material handling in the context of facilities planning. **(3Mks)**

b) Material Handling equipment are usually of many types and classification. State **Four** general classification of MH equipment and give an three example and purpose in each category. **(4Mks)**

c) A metal processing Company has a facility with six departments (A B C D E, and F). A summary of the processing sequence for 10 products and the weekly production forecasts for the products are given in the tables below.

  i. Construct a **from- to chart** for the facility, based on the expected weekly production **(3Mks)**

  ii. Perform a **Pareto analysis** of the flow and develop a **Relationship chart (4Mks)**

  iii. Develop a **relationship diagram**. **(2Mks)**

  iv. Develop a **block layout design** which is best suited for the Company. **(4Mks)**

Product	Processing sequence	Weekly production
1	ABCDEF	960
2	ABCBEDCF	1200
3	ABCDEF	720
4	ABCEBCF	2400
5	ACEF	1800
6	ABCDEF	480
7	ABDECBF	2400
8	ABDECBF	3000
9	ABCDF	960
10	ABDEF	1200

Dept.	Dimension
A	40'*40'
B	45'*45'
C	30'*30'
D	50'*50'
E	60'*60'
F	50'*50'

Question 3: (20Mks)

a) Outline four types of inventory that is commonly kept by Manufacturing companies **(2Mks)**

b) Discuss **three** types of costs associated with Inventory and give example of each. **(3Mks)**

c) Briefly discuss at least **four** reasons for keeping inventory. **(4Mks)**

d) A maintenance department buys two types of spare parts from the same supplier. Spare part A costs $15 per piece while spare part B costs $38 per piece. For any order the Maintenance department makes, an ordering cost of $100 is incurred. The holding costs for maintenance spare parts are based on a 25% annual interest rate (i.e. 25% of part cost per piece). The department uses an average of 20,000 spare part A and 14,000 spare part B.

   (i) Determine the **optimal size** of orders for Spare part A and B, the **optimal times** between the placement of orders and the yearly **inventory cost** (holding and ordering) for these two spare parts. **(6Mks)**

   (ii) The Maintenance manager is considering placing an order for the two parts at the same time instead of ordering them separately. This will ensure he pays only one ordering cost of $100 for each order made. Advice the maintenance manager

whether it better to order together or separately, and the optimal times of order placement. **(5Mks)**

Question 4: (20Mks)

a) Explain what the terms Master Production schedule (MPS) entail and the key data required to calculate the MPS **(2Mks)**

b) Explain what is MRP and with a use a diagram, discuss at least **four** key inputs of an MRP plan. **(4Mks)**

c) Lintech Company produces a special type of low price laptops for basic instruction purposes. To make the laptop, they have to buy the Central processing units (CPU) and Disk drives from different suppliers. One laptop needs one CPU and 2disk drives.

		Week					
Current inventory − 7500		1	2	3	4	5	6
F_t		6000	6000	5600	5000	6000	5000
O_t		1600	4000	3500	500	0	0

i)   Given the forecasts (F_t), customer orders (O_t), and on -hand inventory (I_t) for the special laptops at beginning of June till Mid August. Derive the MPS plan for Lot-for-lot. **(3Mks)**

ii)   Further the company wants to change their production schedule and only produce in a Batch of 8000 laptops per production run, instead of lot-for-lot process. Derive the MPS plan for Batch production. **(3Mks)**

iii) Develop a Product structure and determine the planned order release for the CPU and Disk drives assuming a lot-for-lot scheduling rule. **Note:** The On-hand Inventory for CPU is 2000 at week 1 of June. There are scheduled receipts of 8000 Disk drives in week 2 of June. Assume the Laptops need **one week** production time. The lead time for CPU delivery is **two weeks** while the lead time for Disk delivery is lead time is **one week**. **(8Mks)**

Question 5: (20Mks)

(a) Explain the main difference between PERT and CPM. **(4 marks)**

(b) A Steel company is planning to install steel plant in Kenya due to the perceived expected high growth of the economy in Kenya. Of late, the growing economy has stimulated high infrastructural development and construction (roads, airports, energy sector etc), which demands high steel consumption. Though the firm is new to the Kenyan environment, it is interested in exploring the investment in the country. You are hired as a consultant Engineer to advice the company on some critical areas successful design, commissioning and operation of the Industry. Advice the Steel Company on **at least seven** operations management decisions they should undertake before they invest in the company. **(7Mks)**

d) A small company packages flowers for large supermarket chains. Based on the past experience and committed contracts, the company estimates that sales over the next five years in **thousands** of packages will be 300, 120, 200, 110, and 135 respectively. Each worker stays on the job for at least one year and the company have currently three workers on the payroll. The company estimates that it will have 20,000 packages in stock at the end of the current year. On average, the company pays each worker $25,000 per year, where each worker can produce 30,000 packages in the same period. Inventory cost is $0.04 per package per year and shortages are not allowed. Based on the effort of interviewing and training workers, it cost $500 for each worker hired and $1000 for each worker fired.

    i.   Assuming shortages are not allowed, determine the minimum constant workforce that he will need of the next five years. **(6Mks)**

    ii.   Evaluate the cost of the plan found in part (ii) above. **(3Mks)**