OLAYEN VICTOR
EMG/14/0C/904

Department of Production Engineering
Faculty of Engineering
University of Benin, Benin City
2018/2019 Second Semester B.Eng Examination
PRE572: Engineering Management II

Time Allowed: 3Hours **Date: 18th November, 2019**

Instructions: Answer four (4) questions in all. Answer any two questions from each section

Question 1 **Section A**

a. Define the following terms (i) work study, (ii) method study, (iii) motion study, and (iv) time study
b. Discuss the symbols used in method study.
c. Develop a multiple activity chart for doing two loads of laundry, assume you will have access to one washing machine and one dryer.
d. The total observed time for an operation of assembling a motor brake is 100 min. If the rating is 120%, find the normal time. If an allowance of 10% is allowed for the operation, determine the standard time
e. The following data were obtained by a work study man from a study conducted in hours. Calculate total allowances, total available cycle time productive hours, considering a working day of 8 hours.
   i. **Maintenance time**
      a) Get out and put away tools = 15 min/day
      b) Cleaning of machine = 5 min/day
      c) Oiling of machine = 6 min/day
      d) Replenish coolant supply = 4 min/day
   ii. **Interruption**
      a) Interruption by foreman = 5 min/day
      b) Interruption by porter etc. = 4 min/day
   iii. Delay time due to power failure etc. = 10 min/day
   iv. Personal time = 20 min/day

Question 2

a. Explain the following; (i) Trend, (ii) Cyclical, (iii) Seasonal, (iv) Random or irregular (v) scheduling (vi) principles of scheduling
b. Shipments (in tons) of welded tube by an aluminum producer are shown below:

Year	1	2	3	4	5	6	7	8	9	10	11	12
Tons	12	8	11	10	18	7	5	14	14	8	19	21

   i. Compute a 3-year moving average,
   ii. Using a weight of 3 for the most recent data, 2 for the next, and 1 for the oldest, forecast shipments in year 13.
c. The manager of a production plant feels that the demand for plasterboard shipments may be related to the number of construction permits issued in the county during the previous quarter. The manager has collected the data shown in Table.
   i. Fit a simple linear regression forecasting model into the data and hence
   ii. determine a point estimate for plasterboard shipments when the number of construction permits is 30.

Construction permits (X)	Plasterboard shipments (Y)
35	16
15	4
25	13
25	6
20	16
40	9
9	10
15	6

d. Consider the following two machines and six jobs flow shop-scheduling problem. Using Johnson's algorithm, obtain the optimal sequence, which will minimize the makespan.

Job	Machine 1	Machine 2
1	5	4
2	2	3
3	13	14
4	10	1
5	8	9
6	12	11

Question 3

a. Discuss the cost components of any asset.
b. Discuss the basic reasons for considering the replacement of an equipment.
c. A firm is considering replacement of an equipment, whose first cost is #5,000 and the scrap value is negligible at the end of any year. Based on experience, it was found that the maintenance cost is zero during the first year and it increases by #300 every year thereafter. When should the equipment be replaced if $i = 12\%$?
d. A construction company has four large bulldozers located at four different garages. The bulldozers are to be moved to four different construction sites. The distances in miles between the bulldozers and the construction sites are given below. How should the bulldozers be moved to the construction sites in order to minimize the total distance travelled?

Bulldozer/Sit	A	B	C	D
1	90	75	75	80
2	35	85	55	65
3	125	95	90	105
4	45	110	95	115

Section B

Question 4

a. In a tabular form compare Product and Process Layouts in terms of description of machines, product, demand, volume of production, equipment, workers skill, inventory, storage space, material handling and goal.

b. Consider four departments of equal sizes, whose materials flow matrix and the distance matrix are shown in Tables Q4a and Q4b; respectively. Determine the final layout by Pairwise exchange method.

Table Q4a: Material flow matrix

From \ To	1	2	3	4
1	-	10	20	20
2		-	10	5
3			-	5
4				-

Table Q4b: Distance matrix of existing layout

From \ To	1	2	3	4
1	-	1	2	3
2		-	1	2
3			-	1
4				-

Question 5

a. Novel Investment Ltd. accepts #10,000 at the end of every year for 20 years and pays the investor #800,000 at the end of the 20th year. Innovative Investment Ltd. accepts #10,000 at the end of every year for 20 years and pays the investor #1,500,000 at the end of the 25th year. Which is the best investment alternative? Use present worth base with i = 12%.

b. M/S Krishna Castings Ltd. is planning to replace its annealing furnace. It has received tenders from three different original manufacturers of annealing furnace. The details are as follows. Which is the best alternative based on future worth method at i = 15%?

	Manufacturer	
	1	2
Initial cost (#)	8,000,000	7,000,000
Life (years)	12	12
Annual operation and maintenance cost(#)	800,000	900,000
Salvage value after 12 years	500,000	400,000

c. A person is planning a new business. The initial outlay and cash flow pattern for the new business are as listed below. The expected life of the business is five years. Find the rate of return for the new business.

Period	0	1	2	3	4	5
Cash flow (#)	-100,000	30,000	30,000	30,000	30,000	30,000

d. A manufacturing company purchase 9000 parts of a machine for its annual requirements ordering for month usage at a time, each part costs #20. The ordering cost per order is #15 and carrying charges are 15% of the average inventory per year. You have been assigned to suggest a more economical purchase policy for the company. What advice would you offer and how much would it save the company per year?

Question 6

a. Lady B Corporation proposes three sites to locate a warehouse in order to supply customers located at positions A, B, C and D. Which site should it locate the warehouse?

Potential Sites

Site	X	Y
1	360	180
2	250	350
3	400	450
4	420	550

	Customers				
	A	B	C	D	E
X	200	100	250	500	300
Y	200	500	600	300	450
Wt	75	105	135	60	100

b. List the parameters of purchasing, functions of stores and also highlight the advantages of codification