AFRICA UNIVERSITY

(A United Methodist-Related Institution)

"Investing in Africa's Future"

COLLEGE OF BUSINESS, PEACE, LEADERSHIP AND GOVERNANCE

Production and Operations Management (MMS402)

Final Examination November2019

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3 Hours

INSTRUCTIONS

Answer **all Questions**.

Start **each** question on a new page in your answer booklet.

The marks allocated to **each** question are shown at the end of the section.

Show all your workings.

Credit will be given for logical, systematic and neat presentations.

1. Briefly, explain the following Production and Operations Management terms:
   a. Lean production **[4 marks]**
   b. Batch production **[4 marks]**
   c. Fixed position layout **[4 marks]**
   d. Operations management **[4 marks]**
   e. Total Quality Management **[4 marks]**

2. Explain the role and responsibilities of the Operations manager within an organisation. **[10 marks]**

3. A restaurant prepares and serves food and drink to customers. Meals are generally served and eaten on premises but many restaurants also offer take-out (take-away) and food delivery services. Restaurants vary greatly in appearance and offerings including a wide variety of cuisines and service models. Restaurants may include wait staff or waitstaff, others provide counter service and some are buffet style. State 6 inputs, 4 conversion processes, 4 outputs, 2 managers and 4 feedback of the restaurant **[10 marks]**

4. The results of inspection of 10 samples each containing 4 units are tabulated in the following table:

No. of Observations	**Sub-group size**			
	a	**b**	**c**	**d**
1	47	32	44	35
2	33	33	34	34
3	34	34	31	34
4	12	21	24	47
5	35	23	38	40
6	19	37	31	27
7	23	45	26	37
8	33	12	29	43
9	25	22	37	33
10	29	32	30	13

   a. Compute the control limits for the X and R charts. Explain how the results can be used to control the production system in future. **[10 marks]**
   b. Explain the main features of Deming's quality philosophy. **[10 marks]**

5. You are given the estimated annual demand of 10000 gallons of paint, an annual carrying cost of \$0.75 per gallon and ordering cost of \$150 per order. Given also that $TC = \frac{DC_o}{Q} + CD + \frac{QC_h}{2}$, where TC = total cost, Q = order quantity, D = annual demand, C_h = cost of holding item for the whole year and C_o = cost of placing an order.

   (a) Calculate the
      i) Optimum order quantity (Q*) **[3 Marks]**
      ii) Total Cost (TC) **[4 Marks]**

iii) Number of orders per year **[3 Marks]**
iv) Order cycle time **[3 Marks]**

(b) State three assumptions of the Economic Order Quantity (EOQ) model **[3 Marks]**

(c) Explain the ABC inventory classification system **[4 marks]**

6. The process of equalising the amount of work at each workstation is called line balancing

(a). What are the objectives of line balancing? **[4 Marks]**

(b). A company needs to produce 40 photocopier machines per day. There are 480 minutes available per day. Given the following additional information:

Task	Performance time (minutes)	Predecessors
A	10	-
B	11	A
C	5	B
D	4	B
E	12	A
F	3	C, D
G	7	F
H	11	E
I	3	G, H

i) Draw and label a precedence diagram **[5 Marks]**
ii) Calculate the desired cycle time required for the line **[2 Marks]**
iii) Calculate the minimum number of workstations **[2 Marks]**
iv) Group the elements into workstations **[3 Marks]**
v) Calculate the efficiency and balance delay of the line **[4 Marks]**

End of paper

1: Capacity Utilisation	$\text{Capacity utilization rate} = \frac{\text{Capacity used}}{\text{Best operating level}}$
2: Moving Average	$MA_n = \frac{\sum_{i=1}^{n} D_i}{n}$
3: Weighted Moving Average	$WMA_n = \frac{\sum_{1=1}^{n} W_i D_i}{n}$
4: Smoothing Model	$F_{t+1} = \alpha D_t + (1-\alpha)F_t$
5: Adjusted Smoothing Model	$AF_{t+1} = F_{t+1} + T_{t+1}$
6	$T_{t+1} = \beta(F_{t+1} - F_t) + (1-\beta)T_t$
7: Linear Model	$y = a + bx$ $b = \frac{\sum xy - n\bar{x}\bar{y}}{\sum x^2 - n\bar{x}^2}$ $a = \bar{y} - b\bar{x}$
8: Productivity Measure	$\text{Productivity} = \frac{\text{Outputs}}{\text{Inputs}}$
9: Equation	$y = VC(Q) + FC$
10: Total Cost	$TC = \frac{Q}{2}C_h + \frac{D}{Q}C_o + DC$
11: Location Factor Rating	$LFR = Max\left\{\sum_{i=1}^{n} W_i S_{1i};\ \sum_{i=1}^{n} W_i S_{2i};\ \ldots\ldots\ldots;\ \sum_{i=1}^{n} W_i S_{ni}\right\}$
12: Centre of Gravity	$x = \frac{\sum_{i=1}^{n} x_i W_i}{\sum_{i=1}^{n} W_i}, \quad y = \frac{\sum_{i=1}^{n} y_i W_i}{\sum_{i=1}^{n} W_i}$
13: Load Distance	$LD = \sum_{i=1}^{n} l_i d_i$ $d_i = \sqrt{(x_i - x)^2 + (y_i - y)^2}$
14	