UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 6 Examination in Engineering: November 2016

Module Number: ME6304 **Module Name: Production Planning and Control**

[Three Hours]

[Answer **all questions**, each question carries ten marks]

Q1 The selection of facility location for the operations is an important decision in strategic planning of manufacturing corporations. As globalization is transcending national borders, the whole world is becoming the domain of site selection problem.

Volkswagen is one of a leading automobile manufacturer. Assume that they have planned to setup an assembly plant in Sri Lanka.

a) Explain, what are the factors considered while selecting the location for the Volkswagen assembly plant in Sri Lanka?

[3.0 Marks]

b) Explain the term "Brake Even Analysis" in related to the production company?

[2.0 Marks]

c) Three potential locations were identified for setting up the proposed assembly plant in Sri Lanka. The cost structure is given in Table Q1.c.

Table Q1.c

Site	Fixed cost/year (Rs.)Millions	Variable cost/year (Rs.)Millions
Hambantota	4,400	0.5
Anuradhapura	5,000	0.2
Kuliyapitiya	5,200	0.1

The selling price of a product is 3.0 Million Sri Lankan Rupees. Find the most economical site for an expected volume of 2000 units per year?

[5.0 Marks]

Q2 Plant layout refers to the physical arrangement of a production facility. It is the configuration of departments, work centers and equipment in the conversion process. It is a floor plan of the physical facility, which is used in production.

a) State four main types of plant layouts.

[2.0 Marks]

b) Compare the advantages and disadvantage of different types of plant layouts.

[2.0 Marks]

c) The MS 800 car is to be assembled on a conveyor belt. Five hundred cars are required per day. Production time per day is 420 minutes, and the assembly steps and times for the wagon are given in Table Q2.c. Find the balance that minimizes the number of workstations, subject to cycle time and precedence constraints.

[6.0 Marks]

Table Q2.c

Task	Task Time (Seconds)	Description	Tasks that must precede
A	45	Position rear axle support and hand fasten	-
B	11	Four screws to nuts	A
C	09	Insert rear axle	B
D	50	Tighten rear axle support screws to nuts	-
E	15	Position front axle assembly and hand	D
F	12	Fasten with four screws to nuts	C
G	12	Tighten front axle assembly screws	C
H	12	Position rear wheel 1 and fasten hubcap	E
I	12	Position rear wheel 2 and fasten hubcap	E
J	08	Position front wheel 1 and fasten hubcap	F,G,H,I
K	09	Position front wheel 2 and fasten hubcap	J

I. Draw a precedence diagram

II. Determine workstation cycle time using the equation

$$\frac{Production\ time\ per\ day}{Required\ output\ per\ day\ (in\ units)}$$

III. Determine the theoretical minimum number of workstations required by using cycle time calculated in above question (Hint : the actual number may be greater)

IV. Use the largest candidate rule to evaluate the current efficiency of the assembling line (Production rate: 500 cars/day)

Q3 Production Planning and Control (PPC) is a set of functions concerned with the effectively utilization of limited resources of the management of the material flow through the resources, so as to satisfy the customer demand and create profit for the organization.

By assuming that you are working in an apparel manufacturing facility,

a) Discuss the importance of using production planning and control tool for apparel sector.

[3.0 Marks]

b) Briefly discuss the three phases of production planning and control?

[2.0 Marks]

c) Table Q3.c defines the precedence relationships & element times for a new model toy. Use the Kilbridge & Wester method to find the solution for this problem.

Table Q3.c

Element	1	2	3	4	5	6	7	8
$T_{c\,i}$(min)	2.0	1.0	1.6	0.6	2.4	0.4	1.0	3
Immediate Predecessor	---	---	1, 2	2	3	3, 4	4	5, 6, 7

I. Construct the precedence diagram.

II. If the ideal cycle is 3 min, what is the theoretical minimum number of stations required to minimize the balance delay?

III. Compute the balance delay.

[5.0 Marks]

Q4 Materials management is a function, which aims for integrated approach towards the management of materials in an organization. Its main objectives are cost reduction and efficient handling of materials at all stages and in all sections.

a) Briefly discuss the functions/scope of material management.

[2.0 Marks]

b) Briefly discuss the benefits of "Standardization" for manufacturing sector organizations (*Hint: You may use an example*).

[2.0 Marks]

c) Briefly discuss the importance of maintaining inventories.

[2.0 Marks]

d) A manufacturing company purchase 9000 parts of a machine for its annual requirements ordering for month usage at a time, each part costs Rs. 20. The ordering cost per order is Rs. 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 are you going to offer and how much would it save the company per year?

[4.0 Marks]

Q5 A forecasting is an estimation of an event which will happen in future. The event may be a demand of a product.

a) In any industrial enterprise, forecasting is the first level decision activity before taking up the other decisions such as Capacity planning, MRP, Scheduling and etc. Discuss the importance of accurate forecasting techniques for an organization.

[3.0 Marks]

b) Sales for the past 12 months at S & S Company are given in Table Q5.b.

Table Q5.b

Month	Sales ($ Millions)
January	30
February	36
March	42
April	45
May	55
June	69
July	79
August	93
September	81
October	54
November	48
December	45

I. Use a three month moving average to forecast the sales for the months April to December. [1.0 Mark]

II. Use a four-month moving average to forecast the sales for the months May to December. [1.0 Mark]

III. Compare the performance of the two methods by using the mean absolute deviation as the performance criterion. Which method would you recommend? [1.0 Mark]

IV. Compare the performance of the two methods by using the mean absolute percent error as the performance criterion. Which method would you recommend? [2.0 Marks]

V. Compare the performance of the two methods by using the mean squared error as the performance criterion. Which method would you recommend? [2.0 Marks]

Q6 Scheduling can be defined as "prescribing of when and where each operation necessary to manufacture the product is to be performed."

a) Briefly describe the terms "forward scheduling" and "backward scheduling".

[2.0 Marks]

b) Briefly explain why scheduling is important for an organization

[2.0 Marks]

c) Arlington Bank of Commerce and Industry is a busy bank that has requirements for between 10 and 18 tellers depending on the time of day. Lunchtime, from noon to 2 P.M., is usually the busiest. Table Q6.c indicates the "Requirement of Tellers" at different timeframes of the day. The bank now employs only 12 full-time tellers, the other workers are on its roster of available part-time employees.

A part-time employee must work exactly 4 hours per day but can start anytime between 9 A.M. and 1 P.M. Part-timers are a fairly inexpensive labor pool because no retirement or lunch benefits are provided to them. Full time staff, work from 9 A.M. to 5 P.M. but are allowed 1 hour for lunch (Half of the full-staff take their break at 11 A.M., the other half at noon.)

Full-time staff thus provides 35 hours per week of productive labor time. By corporate policy, the bank limits part-time hours to a maximum of 50% of the day's total requirement. Part-timers earn $6 per hour (or $24 per day) on average, whereas full-timers earn $75 per day in salary and benefits on average. The bank would like to set a schedule that would minimize its total manpower costs. Suggest the best cost effective schedule for the Arlington Bank of Commerce?

Table Q6.c

Time Period	Numbers Of Tellers Required	Time Period	Numbers Of Tellers Required
9 A.M - 10 A.M	10	1 P.M- 2 P.M	18
10 A.M -11 A.M	12	2 P.M -3 P.M	17
11A.M - Noon	14	3 P.M - 4 P.M	15
Noon - 1 P.M	16	4 P.M - 5 P.M	10

[6.0 Marks]