



**MAULANA ABUL KALAM AZAD UNIVERSITY OF
TECHNOLOGY, WEST BENGAL**

Paper Code : APM-602

PRODUCTION PLANNING & CONTROL IN APPAREL INDUSTRY

Time Allotted: 3 Hours

Full Marks: 70

*The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words
as far as practicable.*

Group – A

(Multiple Choice Type Questions)

1. Choose the most appropriate option: 1×10=10
- (i) Time allowance considered for Embroidery Machine-A due to the engagement of Operator in Embroidery Machine-B is known as
- (a) Contingency Allowance (b) Interference Allowance
(c) Process Allowance (d) Fatigue Allowance
- (ii) PMTS is related with
- (a) Calculation of Production time loss
(b) Calculation of Fabric consumption
 (c) Standard Allowed minute of a job
(d) Calculation of Operator's Performance Rate %
- (iii) Which of the following control charts are relevant to the Planning of Material Handling System?
- (a) Two handed Process Chart (b) Multiple Activity Chart
 (c) Travel Chart (d) Flow Process Chart
- (iv) 'Activity on Arrow' is related to
- (a) PERT Chart (b) CPM Chart
(c) Gantt Chart (d) PARETO Chart

Turn Over

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- (v) 'Job Card' is related to
- (a) Production Planning (b) Production Scheduling
(c) Production Control (d) All of these
- (vi) Critical path in case of network model of Production Planning is
- (a) the path with maximum stoppages. (b) the path with minimum stoppages.
(c) the path with maximum number of jobs. (d) the path with maximum time duration.
- (vii) If standard Time for a job = T, and actual time taken by the operator = t, write the expression for the Rate of Performance %.
- $$PR\% = 100 \times t/T$$
- (viii) Which of the following Relationships are true between Spreading and Cutting Operation?
- (a) Finish to Start (b) Finish to Finish
(c) Start to Start (d) Start to Finish
- (ix) If the Rating scores in Skill, Effort, Consistency and Condition of a worker are p, q, r and s respectively according to Westinghouse, Principle, then the Rate of Performance % =
- (a) $p + q + r + s$ (b) $(p + q + r + s) * 100$
(c) $(p + q) * 100 / (r + s)$ (d) $(1 + p + q + r + s) * 100$
- (x) WIP is minimum in case of
- (a) Make-Through Process (b) Batch Process
(c) UPS Process (d) QRM Process

Group - B

(Short Answer Type Questions)

Answer any three from the following.

5×3=15

2. Write short notes on
- (a) Principles of Calculation of Operator's Performance Rate according to Westinghouse Method.
(b) Principle of 'KANBAN' in the context of Apparel Production.
3. (a) If the Basic Time for sewing a particular Garment = 15 minutes, calculate the total time required (in days) for manufacturing 48,000 pcs with 60 sewing machines at 60 % efficiency and total time allowance % = 20%. Assume one shift in a day and available working time per shift = 400 minutes.

(b) Specify the basic difference between 'Delay' and 'Slack' with suitable examples.

3+2=5

4. A Job consists of six elements with following observed times and remarks:

Element	Observed Time in Minutes	Remarks
A	1.4	Manual Job
B	1.5	Manual Job
C	2.1	Machine Job
D	5.5	Machine Job
E	1.7	Machine Job
F	2.0	Manual Job

Assuming rest and personal allowance as 10% , contingency allowance as 2 % and process allowance as 4%, calculate the no. of production hours required to complete 16000 pcs. Assume total number of machines = 20, average rate of performance = 80 % and production efficiency % = 70%. 5

5. (a) What are the objectives of Line Balancing in Apparel Production Planning?

(b) If Total Order Quantity = Q pieces, Time Content of each piece of Garment = t (minutes), Average Attendance Percentage of Operator = A , Average Time Utilization Percentage = U . Derive a mathematical expression to calculate the Total Number of manpower required to finish this order in H available Hours. You may assume any other parameter if necessary. 1+4=5

6. Two alternatives are proposed for a process after Method study. Estimated details of those three alternatives are as given under:

Category	Alternative-A	Alternative-B
Initial Investment (Rs.)	60,000	90,000
ROI %	10	40
Process time cycle (minute)	40	10
Human involvement %	50	30

Identify the most appropriate alternative with proper reasoning.

5

Group - C

(Long Answer Type Questions)

Answer any three questions.

15x3=45

7. (a) The Path of Material flow of three Items A, B and C, D, E are as observed below in a manufacturing Industry:

Item	Flow through Departments	Trolley capacity	Avg. consumption per day
A	P -> Q -> R -> T -> U	300 units	3000 units
B	P -> R -> S -> U	500 units	6500 units
C	Q -> S -> T -> U	800 units	4000 units
D	Q -> R -> S -> T	300 units	1800 units
E	R -> S -> T -> U	200 units	800 units

Draw a suitable Travel Chart with suitable remarks.

- (b) Use the above Travel Chart to construct a suitable REL chart. Explain how it can help in the planning for Plant-Layout.

9+6=15

8. (a) The Order Details for Style No. SHG-22 for the month of June 2018, is as given below:

Order No.	SIZE		
	S	M	L
APF 45	32	44	55
APF 50	55	87	78
APF 34	95	54	67
APF 54	55	71	45
APF 55	84	54	65

Make an 'Order CONCENTRATION' to Plan the details of Marker / Markers to complete this Order in an optimum way.

- (b) Prepare a CUT PLAN SHEET based upon the above Marker Plan . Assume Maximum no. of ply in a Spread = 45.

6+9=15

9. (a) Total Order quantity = 12,000 pcs. Avg. fabric consumption = 1.8 meter. Assume Fabric Wastage = 1%, Rate of fabric Inspection = 2000 meters per day, Cutting rate = 2000 pcs per day, Fabric sourcing (in batch) = 7 days, Sewing Time = 12 days, Washing & Ironing time = 8 days, Packing = 6 days. Prepare an ADVANCED Gantt chart for Production Planning and quote a probable date of delivery, if the date of order confirmation = 15th June 2018.
- (b) The Standard Time (in minutes) for 10 elements of a job are given as: - A-0.6, B-2.3, C-0.9, D-0.8, E-0.5, F-1.5, G-0.6, H-0.8, J-0.7, K-1.3. Estimate the desirable Performance Rate of Operator's for each of those jobs to ensure most ideal Line Balancing Condition. $8+7=15$

10. (a) Show a standard format for Creating the 'Operator's SKILL MATRIX' in the context of Sewing Department. Mention the Importance of 'SKILL MATRIX'.
- (b) Suppose three proposals for Plant Layout are identified as Plan-A, Plan-B and Plan-C. Describe the evaluation parameters and principle of evaluation of each proposal for determining the best suitable plan.
- (c) In a Shirt Manufacturing Factory Zad Fashions, the data on the output and various inputs are as mentioned below:

Total Number of Machines per shift	: 80
Total Number of Operators per shift	: 83
Total Number of Helpers per shift	: 8
Total Number of Checkers per shift	: 10
Total Number of Supervisors per shift	: 3
Duration of Work Per Shift	: 400 Minutes
Product Sewn	: Men's half Sleeve Formal Shirt
SAM of the Shirt (Sewing)	: 15 minutes
Average output per shift	: 800 pcs of shirt

Calculate the followings:

- Operator Productivity (Sewing)
- Machine Productivity (Sewing)
- Productive Efficiency of Operators (Sewing)
- Total Labor Productivity (Sewing)

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11.

(a)

Activity	Must Precede	Optimistic Time (Days)	Most likely time (Days)	Pessimistic time (Days)
A	None	1	3	5
B	A	2	3	5
C	B	3	5	8
D	C	1	4	6
E	C	2	5	7
F	D	4	6	9
G	E	1	2	3
H	G	3	5	6
I	F + H	3	6	8

Draw PERT chart and calculate the Followings:

- (i) Expected duration of completion for each activity
- (ii) Earliest and latest finish of each activity
- (iii) Earliest Finish of the entire project
- (iv) Slack time for each activity

(b) Draw a Multiple Activity Chart with suitable remarks for the following observations about a High Speed Computerized Embroidery Machine as on 1st shift, 30th May, 2018 :

- (i) Framing and placement of Fabric — 10 minutes
- (ii) Threading - 20 minutes
- (iii) Delay of 10 minutes due to unavailability of required thread
- (iv) Loading the Design in the Machine CPU — 4 minutes
- (v) Needle Selection — 5 minutes
- (vi) Running one full repeat — 40 minutes
- (vii) Delay of 12 minutes due to power failure.
- (viii) Delay of 10 minutes due to thread breakage
- (ix) Taking off the embroidered fabric and sending for Trimming after folding — 10 minutes.

9+6=15