Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (APM)/SEM-6/APM-601/2011

2011

PRODUCT ENGINEERING AND PLANT LAYOUT

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

(Objective Type Questions)

1. Answer the following questions : 10 × 1 = 10

A) Choose the correct alternatives for the following :

i) PMTS stands for

a) Percentage of Machine Time Selected

b) Predetermined Motion & Time study

c) Predetermined Material Transfer System

d) Post Manufacturing Time Study.

ii) SMV stands for

a) Standard Marginal Value

b) Standard Mean Variance

c) Standard Minute Value

d) None of these.

iii) Standard allowed minute =

a) Observed time + standard time

b) Observed time + break time

c) Basic time + total allowance

d) Standard allotted time – standard stoppage time.

iv) Which of the following charts are useful to obtain a bird's eye view of the entire project ?

a) Two handed process chart

b) Multiple activity chart

c) Operation process chart

d) Flow process chart.

v) Multiple Activity Chart is a useful tool for

a) Production calculation

b) Method study

c) Production planning

d) Lay Lot Planning.

vi) Distinct part of a specific job is termed as

a) Section b) Division

c) Element d) None of these.

vii) What type of plant Layout is ideal in a Bulk production Plant for Men's formal shirt ?

a) Process Layout

b) Product Layout

c) Fixed Position Layout

d) None of these.

viii) 'Cellular Layout' is a usual characteristic of

a) Make through process

b) Batch process

c) Quick Response Manufacturing

d) Both (a) and (c).

ix) 'Activity based costing' is most suitable for a manufacturing plant with

a) limited product variety

b) wide range of product variety

c) high end fashion items

d) staple product.

B) Write brief answer of the following :

x) Mention one example each for 'Making Through process' and 'Progressive Bundling Process' of Apparel manufacturing.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Write short notes on the following : $2\frac{1}{2} + 2\frac{1}{2}$

   a) Different levels of productivity calculation.

   b) Work Breakdown Statement.

3. Illustrate with the help of suitable ANOVA curve, the significance of Export Destination, Salary structure and type of product in the context of Productivity in Apparel Industry.

4. Draw a neat block diagram to show the constitution of standard time by showing different elements of standard time.

5. The sewing machine operators in an apparel factory are expected to work for 400 minutes in a shift of 8 hours. The remaining time is meant for rest and personal needs etc.

   a) Determine the standard time for sleeve attaching operation, whose normal time (basic time) is 2 minutes.

   b) Calculate number of sleeves to be attached per shift.

   c) If the operator engaged on the above job attached 180 pieces of sleeves in a shift, what is his efficiency in that shift ? 2 + 2 + 1

6.

Activity	Must Precede	Optimistic Time (days)	Pessimistic time (days)	Most likely time (days)
A	none	1	4	2
B	*A*	1	3	2
C	*B*	6	9	8
D	*C*	5	7	6
E	*C*	4	6	5
F	*D* + *E*	3	5	4

a) Draw a PERT and CPM network model for the above planning sheet.

b) Calculate expected time for each activity.

c) Determine the Earliest finish time for the entire project. 2 + 2 + 1

7. The activities undertaken by an operator of a high speed computerized Multihead Embroidery machine are as observed under for a particular day :

Threading : 10 minutes

Switch on Machine and Framing : 7 minutes

Loading of Design to the CPU : 3 minutes

Automatic Embroidery (1 full repeat) : 25 minutes

M/c stoppage due to thread breakage and knotting : 8 minutes

Switch off machine and raise frame : 0·10 minute

Taking off the embroidered fabric : 4 minutes

Prepare a multiple activity chart and calculate capacity utilization % of man and machine in the given work cycle.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

8. a) Mention the sequential steps involved in improving the productivity in apparel industry.

b) An assembly operation in Sewing Department consists of five elements with following observed time and the performance ratings :

Element	Observed Time in Minutes	Performance Rating %
A	1·2	80
B	0·5	85
C	1·12	80
D	0·5	95
E	0·10	90

Assuming rest and personal allowance as 15% and contingency allowance as 3% of the basic time, calculate standard allowed time per piece. 9 + 6

9. a) Briefly mention the objectives of a Good Plant Layout in Apparel industry.

b) Mention different types of Plant Layouts generally adopted in manufacturing Industry.

c) Draw a neat flow diagram to illustrate the steps involved in the systematic procedure for plant Layout.

d) The following represents the procedure of Garment washing as observed on 20th March 11 in M/s Pragma Export :

i) Bunch of Garments (40 pcs) are taken from the intermediate storage rack and carried up to the washing machine (5 mtrs away from the rack) : Time taken 2 minutes.

ii) Filling of water to the washing machine : 2 minutes

iii) Adding detergents : 0·5 minutes + Delay of 1·5 minutes for unavailability of the required detergent in proper place.

iv) Mixing detergents : 1 minute

v) Checking & Loading of garments to the washing machine : 5 minutes

vi) Tumble washing cycle : 30 minutes

vii) Unloading of garments : 4 minutes + delay of 1·5 minutes due to unavailability of trolley in proper place.

viii) Carrying the garments up to the hydro extractor (2·5 mtrs away from the washing machine) : 0·2 minutes.

Draw a flow process chart for the above mentioned activities. 4 + 1 + 5 + 5

10. a) Explain the factors to be considered before making the choice of a manufacturing process.

b) Mention in brief the basic characteristics of different manufacturing processes generally adopted in apparel industry.

c) The End Results of a work sampling study conducted on a particular embroidery machine are as under :

Observation of machine Running : 4000

Observations of machine idle : 1000

Total observations : 5000.

i) Calculate the limits of accuracy.

ii) Conclude whether sufficient observations have been made at 95% confidence level. 6 + 5 + 4

11. a) In a Shirt manufacturing factory M/s J. P. Garments, the data on the output and various input are as mentioned below :

Total Number of Machines per shift : 105

Total Number of Operators per shift : 100

Total Number of Helpers per shift : 18

Total Number of Checkers per shift : 15

Total Number of Supervisors per shift : 2

Duration of work per shift : 450 minutes

Product Sewn : Men's Half Sleeve Casual Shirt

SAM of the shirt (sewing) : 15 minutes

Average output per shift : 2000 shirts.

Calculating the following :

i) Operator productivity (Sewing)

ii) Machine productivity (Sewing)

iii) Productive Efficiency of Operators (Sewing)

iv) Total Labor Productivity (Sewing).

b) Illustrate a sample Matrix to be used for evaluating the effectivity of a productivity improvement system in apparel industry.

c) Define the following : 'Delay', 'Inspection', 'Product', & 'Design'. 8 + 5 + 2

12. a) In a ladies T-shirt manufacturing company, Sigma Apparels, the details of order numbers SL-012/11 is as given below :

Date of order confirmation : 15th March, 2011

Date of delivery : 14th April, 2011

Style No. : Sig/L/003

Color No. : Pantone-IP00023

Total number of Pcs ordered : 3000

The details of production planning estimation are as under :

Days required for –

Fabric sourcing : 6 days

Fabric inspection : 4 days

Cutting : 8 days

Sewing : 22 days

Washing & Finishing : 13 days

Ironing : 7 days

Final inspection : 5 days

Packing : 7 days.

Prepare a suitable Gantt chart to make a planning sheet for the order mentioned above.

b) In M/s A. S. Fashions, the following information are collected :

Total working hour per shift = 450 minutes, Avg. absenteeism 8%, Methods effectiveness 90%, Avg. factory performance = 95%, Rework = 12%, Rejection = 3%, Machine delay = 1%, Waiting time = 1%, Miscellaneous delay = 2%.

i) Draw a curve to illustrate detailed break up of the causes of loss in productivity.

ii) Determine the productivity percentage. 6 + 9

13. a)

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

Calculate the following :

i) Expected duration of completion for each activity

ii) Earlest and latest finish of each activity

iii) Earliest finish of the entire project

iv) Slack time for each activity.

b) Mention and explain in brief the factors to be considered before staring product development. 10 + 5

OR

Draw a *Travel Chart* based upon following observations made on 29th March, 2011.

Product	**Movement**	**Volume moved/day (No. of Pcs.)**
P	$A \rightarrow B \rightarrow C \rightarrow E$	250
Q	$C \rightarrow E \rightarrow F$	300
R	$D \rightarrow F \rightarrow G$	150

Assume capacity of the carrier = 25 Pcs.