

2005 SBM OPERATIONS MANAGEMENT FINAL

Time: 180 minutes

Max marks: 50

1. What are the major developments in the history of Operations Management? (2 marks)
2. Briefly explain the major components of an Operations Strategy? (2 marks)
3. What are the four general operations objectives? Give examples for each. (2 marks)
4. Explain the concept of Robust Design. (2 marks)
5. Kero cycles is installing a line to produce a new model of bicycle. Assign the following work elements to workstations, if the desired output is 550Nos in an 8 hour day.

Task	Description	Time (s)	Predecessor
A	Keep frame in stand	10	-
B	Assemble front wheel	30	-
C	Assemble rear wheel	30	-
D	Fit handle	20	A
E	Fix front wheel on handle	15	B,D
F	Fix rear wheel on frame	10	A,C
G	Fit Pedals	10	A
H	Fit chain	20	F,G
I	Fit front brake	18	E
J	Fit rear brake	25	F
K	Fit seat	10	A

(5 marks)

6. Explain how standard times are determined in the predetermined data method (2 marks)
7. Plywood is produced by a pressing operation on a hydraulic press followed by a cutting operation on a shearing machine. At 8:00AM, the various sizes of plywood and the time required on each machine are shown below. Prepare a Gantt chart scheduling jobs on both machines such that all jobs are completed at the earliest.

Job	Size (mm)	Pressing time (hrs)	Cutting time (hrs)
A	6 X 900 X 600	2	2
B	12.5 X 1200 X 900	1	2
C	18 X 1500 X 1200	3	1
D	25 X 1800 X 1200	2	3

(5 marks)

8. A transport company plans to buy tyres and keep in stock. How many tyres should they buy at a time? The demand is expected to be 860 per year, the ordering cost Rs15000 per order, carrying interest rate 25% per year and the cost of one tyre Rs5000. What will be the most economic order quantity? What will be the total expenditure for the year? (5 marks)
9. A mosquito mat machine consists of a base, heating plate, plug pin, top and **four** screws. The MPS calls for 250 machines to be produced in Week 4 and 1000 in Week 6. The assembly operation takes one week. Determine the planned order release quantities and weeks **only for Screw**, if it has an FOQ=3000, beginning inventory 500 Nos, Lead Time 2 weeks and there is an already scheduled receipt of 1200 in week 4. (5 marks)

(5 marks)

10. What are Taylor's principles for workforce management? (2 marks)

(2 marks)

11. Explain the four basic principles of Total Quality Management. (2 marks)
12. List the steps for an organization to achieve ISO9000 certification. (2 marks)
13. Explain what do you mean by the DOMAICSA process. (2 marks)
14. What is the difference between random variation and assignable variation? (2 marks)
15. A company which manufactures television sets collected data on the number produced and found nonconforming everyday as follows:

Number inspected	108	97	105	114	99	89	116	76	93	109
Number nonconforming	4	11	11	8	6	10	12	16	12	8

Calculate trial control limits and identify the points out of control, if any. Graph is not required. (5 marks)

16. Steel sheets are produced by a rolling operation and the thickness of the sheet is an important quality characteristic. Two consecutive units are measured every half hour with the following results after 25 subgroups: $\sum \bar{x} = 624.71$ $\sum R = 0.135112$. Calculate the trial control limits for the process, if for $n=2$, $A_2=1.880$, $D_3=0$ and $D_4=3.267$. (2 marks)
17. A Quality Improvement Team suspected that the hardness of a component depends on the time the component is kept in the furnace. Twenty samples were kept for various times (minutes) in the furnace and the hardness in HV measured as below. Make a scatter diagram of the data and give your conclusions.

Sample No	1	2	3	4	5	6	7	8	9	10
Time in furnace	79	78	58	48	48	76	65	44	64	75
Hardness	266	325	285	262	342	312	316	282	293	318

Sample No	11	12	13	14	15	16	17	18	19	20
Time in furnace	69	39	73	57	64	76	72	67	68	66
Hardness	310	269	291	293	307	285	329	283	283	317

18. Write short notes on any four: a) Business Process Reengineering b) 5S c) Poka Yoke d) OEE e) Gemba Kaizen f) Six Sigma (5 marks)

(4X2=8 marks)

SOLUTIONS TO PROBLEMS:

5.

Target Cycle Time = 8/550 hrs = 52.36 seconds

Theoretical Minimum number of stations = 198/52.36 = 3.78 = 4 stations

Station	Candidates	Choice	Time	Cum Time	Idle Time
S1	A=10, B=30, C=30	B	30	30	22
S1	A=10, C=30	A	10	40	12
S1	C=30, D=20, G=10, K=10	G	10	50	2
S2	C=30, D=20, K=10	C	30	30	22
S2	D=20, K=10, F=10	D	20	50	2
S3	K=10, F=10, E=15	E	15	15	37
S3	K=10, F=10, I=18	I	18	33	19
S3	K=10, F=10	F	10	43	9
S4	K=10, H=20, J=25	J	25	25	27
S4	K=10, H=20	H	20	45	7
S5	K=10	K	10	10	42

7.

	8	9	10	11	12	1	2	3	4	5
Press	B	A	D	C						
Shear		B	A	D	C					

8.

$$Q = \sqrt{\frac{2SD}{iC}} = \sqrt{\frac{2 * 15000 * 860}{0.25 * 5000}} = 143.6 = 144$$

$$TC = \frac{SD}{Q} + \frac{iCQ}{2} = \frac{15000 * 860}{144} + \frac{0.25 * 5000 * 144}{2} = 90000 + 89583.33$$

= Rs179583.33

9.

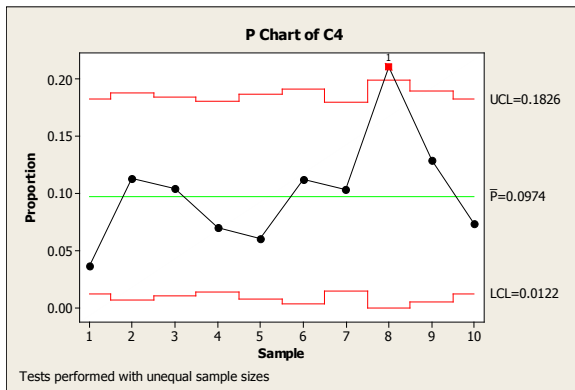
Since the assembly operation takes one week, the requirement of screw is one week ahead.

Item: Screw	Week							
	Lot size: FOQ 2 weeks Lead Time: 2 weeks							
	1	2	3	4	5	6	7	8
Gross requirements			1000		4000			
Scheduled receipts				1200				
Projected on-hand inventory (Beg: 500)	500	500	2500	3700	2700			
Planned receipts			3000		3000			
Planned Order release	3000		3000					

15.

n	d	p	LCL	UCL
108	4	0.037037	0.011817	0.183014

97	11	0.113402	0.007094	0.187737
105	11	0.104762	0.010603	0.184228
114	8	0.070175	0.0141	0.180731
99	6	0.060606	0.008011	0.18682
89	10	0.11236	0.003121	0.19171
116	12	0.103448	0.014821	0.18001
76	16	0.210526	-0.00462	0.199456
93	12	0.129032	0.005172	0.189659
109	8	0.073394	0.01221	0.182621
1006	98	0.097416		



16.

$\bar{x} = 24.9884$, $\bar{R} = 0.00540448$

$UCL_R = D_4 \bar{R} = 3.267 * 0.00540448 = 0.01765643616$

$LCL_R = D_3 \bar{R} = 0.0$

$UCL_{\bar{x}} = \bar{x} + A_2 \bar{R} = 24.9884 + 1.887 * 0.00540448 = 24.9985604224$

$LCL_{\bar{x}} = \bar{x} - A_2 \bar{R} = 24.9884 - 1.887 * 0.00540448 = 24.9782395776$

17. No relationship

