UNIVERSITI SAINS MALAYSIA

Final Examination
Semester I, Academic Session 94/95

October/November 1994

ASU661 - PRODUCTIVITY AND QUALITY MANAGEMENT

Time: [3 hours]

Instructions

Please make sure that this examination paper consists of FIVE printed pages before you begin.

Attempt question No. 1 (COMPULSORY) and THREE questions from Section A and any THREE from Section B.

Q1. The Dum Dum Cement Company packs 10kg and 40kg bags of concrete mix. The standard times for the filling activity are 2.2 man-minutes and 3.5 man-minutes for 10kg and 40kg bags respectively. The operators work 8 hours per day 5 days a week.

(a) If the operator working on this operation produces on an average 95 bags of 10kg mix and 60 bags of 40kg mix daily, calculate his productivity.

(b) The company has decided to increase the production to 120 bags of 10kg mix and 80 bags of 40kg mix every day. What will be the labour productivity of this filling operation now?

(c) The company has decided to give incentive bonus of RM0.20 for every increase percentage of productivity over 100% to achieve increased production. If the operator is paid RM24 per day, calculate the labour cost of filling 1 bag of 10kg mix and 1 bag of 50kg mix. How much bonus the operator would make per week?

[16 marks]

...2/-

SECTION A (Attempt any THREE questions)

Q2. (a) Discuss briefly the factors which are generally responsible for a low materials productivity?

(b) There are many approaches to productivity measurement and analysis in enterprises. State simple and practical approaches to analyse productivity in an industrial organisation.

[14 marks]

Q3. Improving productivity has become a major objective of many organisations. Productivity Improvement programs (PIP) are initiated to achieve this objective. What conditions must prevail to use these programs effectively? What are the main elements of a successful PIP program?

[14 marks]

Q4. You are an Operations Manager and have been asked by the Managing Director to allocate the production departments A, B, C and D to four managers Michael Ho, Mohammad Ali, Lim Chee and Saleem Khan. From the personal files of these four persons, you have obtained their past performances which varied when they worked for similar departments. These performances are given in the table.

Manager	A	B	C	D
Micheal	85%	60%	70%	80%
Mohammad	90%	70%	60%	30%
Lim	40%	80%	70%	90%
Salem	45%	40%	55%	70%

What manager should be assigned to which department to get the maximum productivity?

[14 marks]

...3/-

Q5. Syed Ismail is the manager of the body repair shop. On Monday morning he arrived at work and discovered that the firm's wrecker service had towed-in five cars involved in weekend accidents. In all cases, the owners had authorised the shop manager to make all necessary repairs. Syed carefully analysed the extent of damage to each car and noted the time (in hours) that each car would require at each station in the body shop. The time estimates are given in the following table.

	Repair and Parts Replacement	Preparing for Painting	Painting + Baking
Toyota	12 hrs	4 hrs	5 hrs
Ford	6	2	7
Nissan	9	5	6
Proton	10	5	8
Renault	8	3	9

Syed wanted to minimise waiting time and total time, consumed in repairing these five cars. In what sequence should the cars be routed through the work-stations to achieve the objective?

[14 marks]

SECTION B (Answer any THREE questions)

Q6. Both Deming and Juran have contributed significantly in improving the total quality. Discuss briefly their contributions and compare their philosophies for achieving enhanced quality and increased productivity.

[14 marks]

Q7. There are many tools and techniques which can effectively be used to support the implementation of the methodology for quality management and improvement. List at least eight such tools and techniques commonly used in the industry and discuss any two of them.

[14 marks]

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Q8. The following table gives the average and range strength in kilograms for tensile tests performed on an improved plastic cord. The sub-group size is 4. Determine the trial central line and control limits.

S. No	X	R	S. No	X	R
1	476	32	14	482	2
2	466	24	15	506	23
3	484	32	16	496	23
4	466	26	17	478	25
5	470	24	18	484	24
6	494	24	19	506	23
7	486	28	20	476	25
8	496	23	21	485	29
9	488	24	22	490	25
10	482	26	23	463	22
11	498	25	24	469	27
12	464	24	25	474	22
13	484	24			

[14 marks]

Q9. a) What is loss-function approach used in Taguchi's philosohy?

b) In what way Taguchi approach is distinquished from traditional inspection-based quality control?

[14 marks]

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TABLE B Factors for Computing Central Lines and 3σ Control Limits for $\bar{X}$, s and R Charts.

OBSERVATIONS IN SAMPLE, n	CHART FOR AVERAGES: FACTORS FOR CONTROL LIMITS A	A_2	A_3	CHART FOR STANDARD DEVIATIONS: FACTOR FOR CENTRAL LINE c_4	FACTORS FOR CONTROL LIMITS B_3	B_4	B_5	B_6	CHART FOR RANGES: FACTOR FOR CENTRAL LINE d_2	FACTORS FOR CONTROL LIMITS d_1	D_1	D_2	D_3	D_4
2	2.121	1.880	2.659	0.7979	0	3.267	0	2.606	1.128	0.853	0	3.686	0	3.267
3	1.732	1.023	1.954	0.8862	0	2.568	0	2.276	1.693	0.888	0	4.358	0	2.574
4	1.500	0.729	1.628	0.9213	0	2.266	0	2.088	2.059	0.880	0	4.698	0	2.282
5	1.342	0.577	1.427	0.9400	0	2.089	0	1.964	2.326	0.864	0	4.918	0	2.114
6	1.225	0.483	1.287	0.9515	0.030	1.970	0.029	1.874	2.534	0.848	0	5.078	0	2.004
7	1.134	0.419	1.182	0.9594	0.118	1.882	0.113	1.806	2.704	0.833	0.204	5.204	0.076	1.924
8	1.061	0.373	1.099	0.9650	0.185	1.815	0.179	1.751	2.847	0.820	0.388	5.306	0.136	1.864
9	1.000	0.337	1.032	0.9693	0.239	1.761	0.232	1.707	2.970	0.808	0.547	5.393	0.184	1.816
10	0.949	0.308	0.975	0.9727	0.284	1.716	0.276	1.669	3.078	0.797	0.687	5.469	0.223	1.777
11	0.905	0.285	0.927	0.9754	0.321	1.679	0.313	1.637	3.173	0.787	0.811	5.535	0.256	1.744
12	0.866	0.266	0.886	0.9776	0.354	1.646	0.346	1.610	3.258	0.778	0.922	5.594	0.283	1.717
13	0.832	0.249	0.850	0.9794	0.382	1.618	0.374	1.585	3.336	0.770	1.025	5.647	0.307	1.693
14	0.802	0.235	0.817	0.9810	0.406	1.594	0.399	1.563	3.407	0.763	1.118	5.696	0.328	1.672
15	0.775	0.223	0.789	0.9823	0.428	1.572	0.421	1.544	3.472	0.756	1.203	5.741	0.347	1.653
16	0.750	0.212	0.763	0.9835	0.448	1.552	0.440	1.526	3.532	0.750	1.282	5.782	0.363	1.637
17	0.728	0.203	0.739	0.9845	0.466	1.534	0.458	1.511	3.588	0.744	1.356	5.820	0.378	1.622
18	0.707	0.194	0.718	0.9854	0.482	1.518	0.475	1.496	3.640	0.739	1.424	5.856	0.391	1.608
19	0.688	0.187	0.698	0.9862	0.497	1.503	0.490	1.483	3.689	0.734	1.487	5.891	0.403	1.597
20	0.671	0.180	0.680	0.9869	0.510	1.490	0.504	1.470	3.735	0.729	1.549	5.921	0.415	1.585