S8 2005 QUALITY ENGINEERING AND MANAGEMENT– FINAL TEST

Time: 180 minutes, Max marks: 100, all questions carry 5 marks each except where mentioned otherwise.

Use of Statistical Tables / SQC Tables is permitted. Choose a significance level of 0.05

1) Explain David Garvin's eight dimensions of Quality.

2) Describe the concept of Universal Responsibility in Total Quality Management.

3) What are Deming's principles for transformation of management?

4) Discuss the difficulties in identifying who is/are the customer/s of an organization.

5) Why is it important to resolve customer complaints promptly? Justify based on the ASQ study.

6) What are the characteristics of successful teams?

7) What are the different possible sources to identify problems in the Seven Step process?

8) Discuss the factors usually considered while rating suppliers.

9) Explain the concept of optimum quality costs.

10) Who gives ISO 9000 certification? What are its possible benefits to an organization?

11) Sketch and explain what is Interrelationship Matrix in the House of Quality (QFD).

12) Explain how the Detection score is given in FMEA. An FMEA was conducted for the product centrifugal pump. A possible failure mode was identified as leakage in the suction pipe. This can cause failure to pump resulting in a Severity score of 8. The Occurrence score was determined as 3 and Detection score as 6. Calculate the RPN.

13) What do you mean by SMED? A forging press with a rated capacity of 500 pieces an hour is scheduled to work from 08:00 to 17:00hrs with a lunch break from12:30hrs to 13:00hrs. Due to failure of hydraulic circuit, there was a stoppage of 90minutes today. The production for the day was 3000 pieces, out of which 100 pieces had to be scrapped and 500 reworked. Determine the OEE.

14) A company needs to deliver to deliver documents to its head office through a courier service. Trials were carried out by giving consignments randomly to two courier services with the following results of the number of days taken to deliver:

Flanc	5	4	5	3	5	4	6	6	6	5
Provenal	6	5	6	6	6	7	4	8	6	7

Prepare boxplots comparing the two companies on a graph sheet and give your conclusions.

15) The tool life of two makes of cutting tool inserts needed to be compared. Since the tool life depended on the hardness of the material sample, the tool life in minutes was measured on the same sample of material with both the makes of inserts as given below. Is there a statistically significant difference between the two makes?

Material sample	1	2	3	4	5	6	7	8	9	10
Wixad	9.8	9.4	7.8	7.2	9.8	11.3	6.9	9.7	7.5	8.2
Sadia	11.6	8.4	8.9	9.7	13	9	10.3	9.5	11.3	11.4

PTO

16) The compressive strength of concrete was being studied and four different mixing techniques were being investigated. The experimental results were:

Mixing Method	Compressive strength			
1	31	30	28	29
2	32	33	30	28
3	28	29	29	31
4	28	27	25	28

Carry out an ANOVA to test whether mixing technique affected the strength of concrete. (8 marks)

17) A chemical process involves the factors time (A), concentration (B), pressure (C), and temperature (D). A 2^4 factorial experiment was carried out to optimize the yield (Y) and the results are in the table below. Calculate the effects and identify the significant ones using Pareto principle.

A	B	C	D	Y
-1	-1	-1	-1	12
1	-1	-1	-1	18
-1	1	-1	-1	13
1	1	-1	-1	16
-1	-1	1	-1	17
1	-1	1	-1	15
-1	1	1	-1	20
1	1	1	-1	15
-1	-1	-1	1	10
1	-1	-1	1	25
-1	1	-1	1	13
1	1	-1	1	24
-1	-1	1	1	19
1	-1	1	1	21
-1	1	1	1	17
1	1	1	1	23

(8 marks)

18) The residuals in the above experiment were calculated as: -0.375, 0.875, 0.625, -1.125, -1.625, 0.125, 1.375, 0.125, -1.625, 0.625, 1.375, -0.375, 1.125, -1.125, -0.875, 0.875. Make a Normal Probability Plot of these residuals on ordinary graph paper and analyse. (8 marks)

19) A factory produces microchips. The number of microchips produced for 20 days and the number found nonconforming are given below. Construct a p-chart for the data. Graph is not required.

Inspected	50	90	100	90	80	40	50	50	110	70
Nonconforming	4	6	8	7	8	4	6	5	8	6
Inspected	80	120	100	80	110	40	40	50	120	50
Nonconforming	6	8	20	5	8	6	4	7	5	4

20) Light bulbs are tested for their luminance, with the intensity of brightness desired to be within a desired range. Random samples of five bulbs are chosen from the output, and the luminance is measured. The sample mean $\bar{x}$ and the standard deviation s are found. After 30 samples, the following summary information is obtained: $\sum_{i=1}^{30} \bar{x}_i = 2550$, $\sum_{i=1}^{30} s_i = 195$. Calculate the control limits for $\bar{x}$ and s charts. Determine Cp and Cpk if the specification limits are 90+/-15 lumens.

21) Why is inspecting a fixed number better than inspecting a fixed percentage of the lot? Explain with the help of OC curves. Determine the sample size, acceptance number and rejection number for a single sampling plan as per ISO2859-1:1999 for normal inspection if the AQL is 0.65% and the lot size is 1500.

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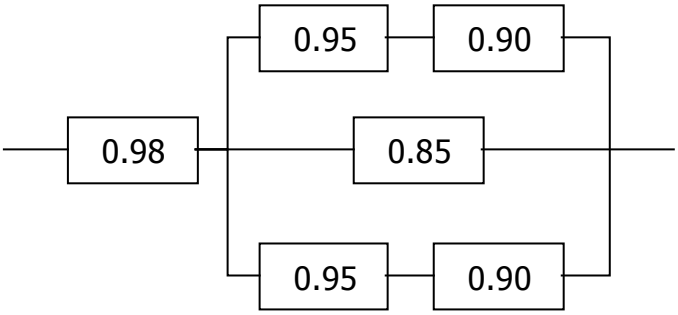
22) A double sampling plan has first sample size as 60 and second sample size 80 with an acceptance number of 1 on the first sample and 3 on the second sample. Determine the probability of acceptance of a lot containing 2% nonconforming.

23) Define Reliability. A manufacturer determines that the average television set is used 1.8hr/day. A one-year warranty is offered on the picture tube having a MTTF of 2000hr. If the distribution is exponential, what fraction of the tubes will fail during the warranty period.

24) Determine the reliability of the following system:



25) Compare a failure terminated test with a time terminated test. Fifteen components undergo a 100 hour life test. Failures occur at 31.4, 45.9, 50.1, 58.4, 70.7, 73.2, 86.6 and 96.3 hrs. Determine the mean failure rate if the failed items are not replaced. Assume constant failure rate.

26) Define Taguchi's three most common loss functions. The specifications for a capacitor are 100+/-10mF. The loss to the customer at the specification limit is Rs5.00. Determine the average loss to the customer if a random sample of 10 capacitors gave the following results: 103.7, 103.2, 99.8, 103.5, 98.2, 101.1, 100.3, 99.2, 102.8, 102.4.