2004 S8PM QUALITY ENGINEERING AND MANAGEMENT

Time: 180 minutes Max marks:100

Use of Statistical Tables is permitted. Choose a significance level of 0.05, wherever applicable.
Graph sheet will be provided, if required.
All questions carry 5 marks each, except where mentioned otherwise.

1. What are Deming's 14 points for management?

2. List the various methods of obtaining customer feedback?

3. Explain the four different types of teams used for quality and productivity improvement.

4. What are the common team problems and their solutions? Explain.

5. Explain the three components of the Juran Trilogy.

6. Discuss the Six Sigma methodology.

7. Describe Ishikawa's principles for good Customer Supplier relationship.

8. Explain the concept of optimum quality cost.

9. What are the possible benefits of ISO9000 certification to an organization?

10. Explain how "Technical Descriptors" are prioritized in QFD.

11. Explain "Severity" and how it is determined for an FMEA.

12. A machine is scheduled to work from 8am to 5pm in a day with a scheduled lunch break of 60minutes. Today, 3hrs were lost due to malfunction of a switch. The machine produced 300 components today, which has a theoretical cycle time of 45 seconds. Of this, 18 components had to be reworked and two scrapped. Determine the availability, performance, quality rating and OEE.

13. Prepare a neat Pareto diagram (use graph sheet) for the following data of accidents in a factory:

Type of accident	No of accidents
Chips falling in eye	45
Electric shock	2
Finger cut	15
Slipped and fell	12
Belt breakage	6
Falling from height	3

(10 marks)

14. Explain what do you mean by the statement: A process is in control.

15. The diameter of one end of a gyro drive shaft is subject to statistical control using average and range charts. After 30 subgroups of 5 shafts each have been examined, $\sum \overline{x} = 34290$ and $\sum R = 330$. Calculate control limits. If the specification limits are 1150+/-20, determine Cp and Cpk.

(10 marks)

16. A transformer is given 100% inspection every hour as it is manufactured, and the resulting data are summarized in the following table:

Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Number inspected	48	36	50	47	48	54	50	42	32	40	47	47	46	46
Number outside specs	5	5	0	5	0	3	0	1	6	2	2	4	1	0

Calculate the central line and variable control limits of a p chart using 3 sigma control limits. Revise till all points are in control.

(10 marks)

17. Explain with an example the main deficiency of a One Factor at a time experiment.

18. To compare two makes of UPS', they were run continuously for one day. Their voltage output was checked randomly during the day and the values were: UPS A - 228, 229, 227, 232, 231, 232, 232, 226, 234, 226, 229, 231 and UPS B - 245, 243, 242, 232, 241, 236, 248, 241, 242, 242, 240, 232. Prepare neat box plots (use graph paper) comparing the voltage output of two UPS' and draw conclusions.

(10 marks)

19. For developing a new product, three grades of plastic could be used. Samples were made of the three materials, but the new die broke before the fourth sample in Grade C could be completed. The strength of the samples was tested with results as below:

Grade A	22	23	21	19
Grade B	21	19	20	21
Grade C	18	21	19	-

Is there a significant difference between the grades?

(10 marks)

20. A food technologist carried out a 2^2 experiment to study the effect of sugar content and syrup content on the taste of a soft drink. The taste is evaluated by a panel of five blindfolded testers and scores given from 1 to 10. Calculate the effects and interactions if the details are:

Sugar g/l	Syrup ml/l	Responses
0	0	3, 2, 2, 4, 4
50	0	5, 4, 3, 7, 6
0	20	2, 1, 3, 1, 3
50	20	6, 7, 6, 5, 6

21. Develop the model equation for the uncoded variables and determine the residuals for the following two factorial experiment with two levels each. Assume that all effects except B are significant.

Uncoded A	**Uncoded B**	**Rep1**	**Rep2**	**Variable**	**Effect**
10	100	6	7	1	7.25
20	100	5	7	A	5.5
10	200	2	3	B	2
20	200	12	16	AB	6

(10 marks)

22. Ten samples of a capacitor measured 97, 97, 93, 100, 101, 102, 98, 105, 104, and 102 microfarads. If the specification of the capacitor is 100+/-10 microfarads and the average repair cost Rs100.00, determine the average loss in the selected sample.