THE OPEN UNIVERSITY OF SRI LANKA

DEPARTMENT OF TEXTILE AND APPAREL TECHNOLOGY

POST GRADUATE DIPLOMA IN TECHNOLOGY
(APPAREL PRODUCTION & MANAGEMENT)

FINAL EXAMINATION- 2015/2016

TTM7138- QUALITY MANAGEMENT

DURATION: 03 HOURS

Date: 04th December 2016 Time:0930-1230hrs

Total number of questions: 07

Number of questions to be answered: 05

Marks for each question are indicated at the end of the question. **Use separate sheets to answer for these questions.**

Q1.(a) Briefly explain why it is very much essential to understand the customer needs and expectations in order to grow up a business. You may consider the quality in design and manufacturing, market point of view and continuous improvement of the products. (30 marks)

(b)(i) According to the Deming's 6th point, employee training should be an integral part of proper industrial performance. Explain why?(20 marks)

(ii)According to Deming's 12th point, briefly explain why appreciation of workmanship is very essential specially in labour intensive industry. (20 marks)

(c) (i) Briefly explain the main two (02) differences between manufacturing sector and service sector organaisations. (20 marks)

(ii) Give two (02) examples to show why effectiveness and efficiency is utmost important to a service sector organaisation. (10 marks)

Q2. (a) Briefly explain three (03) reasons to show that the quality circle is a very important quality tool. (30 marks)

(b) A quality controller has reported the following values for the strength of fabric samples taken from 5 rolls. Fabric strength has measured in N. He checked four samples per each fabric roll. Required constant values to calculate UCL and LCL are given in a table at the end of the question paper.

Fabric roll	Sample 1	Sample 2	Sample 3	Sample 4
1	85.2	84.4	83.4	82
2	85.4	85.1	83	83.3
3	85.2	84.5	86.3	75
4	81.2	80.3	80.5	81
5	80.5	81	81.2	81.3

Calculate the UCL and LCL used to draw a mean control charts and range control charts. You may not require to draw the charts.
(40 marks)

(c) (i) Draw a example diagram to show the concept of a tree diagram.
(10 marks)

(ii) Briefly explain how do you use a tree diagram to build a matrix diagram. (20 marks)

Q3. (a) Briefly explain why quality functional deployment (QFD) is important for a production organaisation (20 marks)

(b) A team in an accounting group has been working on improving the processing of invoices. The team is trying to reduce the cost of processing invoices by decreasing the fraction of invoices with errors. The team developed the following operational definition for a defective invoice: an invoice is defective if it has incorrect price, incorrect quantity, incorrect coding, incorrect address, or incorrect name. The team decided to pull a random sample of 100 invoices per day. If the invoice had one or more errors it was defective. The data from the last 7 days are given in the table to draw a *p* chart *(attribute chart)*.

Day number	Invoices inspected	Number defective
1	100	22
2	100	20
3	100	32
4	100	30
5	100	18
6	100	21
7	100	20

(i) Calculate UWL, LWL, UCL and LCL (40 marks)

(ii) Draw a *p* chart and determine whether the processing invoices is statistically control or not and give the reasons for your answer. (40 marks)

Q4. (a) (i) What is meant by "Process capability"? (8 marks)

(ii) One process capability index is Cp. Briefly explain how the control charts look likes when the process is under control (Cp>1), just meet the specifications (Cp=1) and unstable (Cp< 1) using the suitable charts. (12 marks)

(b) A manufacturing process produces a certain part with a mean diameter of 2 inches and a standard deviation of 0.03 inches. The lower and upper engineering specification limits are 1.90 inches and 2.05 inches respectively.

(i) Calculate the Cp of the process and give your comments on the process capability with giving the reasons. (20 marks)

(ii) Calculate the Cpk of the process and comment on the value with providing the reasons for your comment. (20 marks)

(c) Probability sampling and non-probability sampling are main two sampling methods. Give one (01) example for **each** these two sampling methods and briefly explain them. (40 marks)

Q5. (a) (i) What is meant by "Operating characteristics (OC) curve"? (10 marks)

(ii) Draw a sample OC curve and mark consumer's risk, producer's risk on it. Determine acceptable quality level (AQL) and Lot tolerance defective (LTPD)amounts for the considered product batch.(30 marks)

(b) Briefly explain why following four (04) management principles given in ISO 9000 are important to practice for an organaisation. (40 marks)

(i) Customer focus (ii) Leadership (iii) Involvement people

(iv)Continual improvement

(c) Briefly explain what is "Quality audit" and its' importance. (20 marks)

Q6. (a) (i) What are the four (04) types of quality costs and give two (02) examples for **each** type. (12 marks)

(ii) Draw a graph and briefly explain how these mentioned four quality costs types vary with the **quality level of a product**. (18 marks)

(b) Differentiate following costs types and give suitable examples for **each.**

(i) Manufacturing costs and Non-manufacturing costs (20 marks)

(ii) Product costs and period costs (20 marks)

(c)(i) Describe the asserts that a company gained through six sigma implementation. (15 marks)

(ii) Give any five (05) advantages of implementing Just in Time (JIT) in a production organaisaton. (15 marks)

Q7. (a) In quantifying reliability, bath tub curve pattern is frequently used and it has main three phases. Describe the behavior of product failures during these three(03) phases. (30 marks)

(b)(i) Reliability engineer selected 120 specimens of a product and observed the time to fail these specimens. Results are given below.

No. of components failed	Time to failure (hr)
12	200
25	250
27	288
56	380

Calculate the mean failure rate (MFR) for **failing the items at 288hrs**. (20 marks)

(ii) A LED bulb company produces large number of bulbs in a week period and quality control department decided to check 120 bulbs for 500hrs with the interval of 100hrs.

Time interval hrs	No. of failures
T<100	0
100<T<200	0
200<T<300	30
300<T<400	45
400<T<500	25

- Calculate the mean time to failures (MTTF) at the end of 500hrs. (20 marks)

(c)The failure rate of a printed circuit board, which has six components, for 20hrs is given below.

Component type	Quantity	Failure rate/hr
1)Ceramic capacitor	30	0.00001×10^{-6}
2)Tantalum capacitor	10	0.0003×10^{-6}
3)Carbon resistor	30	0.00001×10^{-6}
4)Diodes	10	0.0002×10^{-6}
5)Transistors	15	0.0005×10^{-6}
6)Logic IC	20	0.001×10^{-6}

Calculate the predicted reliability of the printed board, if the component failure behavior follows **an exponential distribution**. (30 marks)

Factors for Control Charts

Items per sample (n)	A_2	D_3	D_4	D1	D2
2	1.880	0	3.267	0.04	2.81
3	1.023	0	2.575	0.18	2.17
4	0.729	0	2.282	0.29	1.93
5	0.577	0	2.115	0.37	1.81
6	0.483	0	2.004	0.42	1.72
7	0.419	0.076	1.924	0.46	1.66
8	0.373	0.136	1.864	0.50	1.62
9	0.337	0.184	1.816	0.52	1.58
10	0.308	0.223	1.777	0.54	1.55