

The Open University of Sri Lanka
Faculty of Engineering Technology



Study Programme	: Master of Technology in Industrial Engineering – Level 7
Name of the Examination	: Final Examination
Course Code and Title	: MEX7214 – Quality & Reliability Engineering
Academic Year	: 2016/17
Date	: 27 th November 2017
Time	: 09.30-12.30
Duration	: 3 hours

General Instructions

1. Read the questions carefully before answering.
2. Please note that you should write your registration number and your index number in each pages of your answer book. Do not write your name.
3. In case of doubt, please consult the supervisor or an invigilator conducting the examination.
4. This paper consists of Eight (08) questions. Answer only five (05) Questions.
5. Normal distribution table is provided.

Q1.

- a) Quality is a term that has been defined in many ways. Individuals, groups of companies and international organizations have attempted to define quality. Discuss too such definitions. You may select one definition from an individual and one from an organization.
- b) Explain how you would plan to achieve quality starting from the definition. You may select one of the definitions of quality to support your answer.

Q2.

- a) Unclear, inadequate product specifications will lead to many quality and operational problems. Comment on this statement.
- b) “Standardization at organizational level helps to maintain quality”. Explain this statement.

Q3.

- a) Define the term “reliability” and explain the key terms in the definition.

- b) It is desired that a power plant be in operating condition 95 percent of the time. The average time required for repairing a failure is about 24 hours. What must be the mean time between failure in order to the power plant to meet the 95 percent requirement?

Q4.

Write an account on each of the following statements.

- a) "Internal customer concept if practiced effectively will improve processes and strengthen relationships between employees at different levels of an organization".
- b) "Managing an organization for quality needs to implement Total Quality Management concepts and practices".

Q5.

- a) During factory floor operation it is important to achieve conformance to specification. There are other aspects such as minimizing defectives, waste and cost and also reducing cycle time. Write an account on the aspects to be considered for successfully meeting those challenges.
- b) To maintain quality it is important to motivate factory workers continuously. However, motivation is not the only answer to errors and defects caused by factory workers. How do you approach to analyse the situation of errors and defects caused by factory workers?
What are the remedial actions you would suggest to minimize errors and defects?

Q6.

A certain process produces metal pieces having a length normally distributed with standard deviation 1.2mm. These metal pieces are used for the assembly of the end product. Pieces less than 100mm length are undesirable for the assembly process. However, a temporary concession has been given to accept 0.5 percent pieces having lengths less than 100mm.

- a) Under the temporary concession, what should be the mean value of the metal piece producing process?
- b) In the above process metal pieces having lengths greater than 105mm are unacceptable and no concession is allowed. If the upper specification limit is considered critical, is the process capable of meeting the upper specification limit?
- c) If the process is to be improved so that the metal pieces meet specification limits, what should be the minimum standard deviation?

Q7.

- a) Variation in product quality is a common feature.
No two products are same. Write an account on how this variation occur.

b) Variation results in producing defectives. A fraction defective control chart has been setup at a particular step of a process. In setting up the control chart 50 items were inspected each time. The central line of the control chart is 0.02. An inspector in using the control chart took 50 items and found 5 items defective.

I. In terms of statistical control, what is your opinion regarding the state of the process at this time?

II. If the company specification for defectives is 6 percent maximum, what is your opinion regarding the use of the control chart for the future?

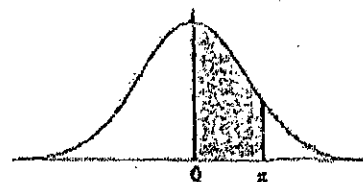
Q8.

a) There are seven basic tools for solving quality problems. Name 4 such tools.

b) Indicate the usefulness of each tool named under part (a) in quality related work.

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Areas under the Standard Normal Curve from 0 to z



Z	0	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2996	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000