BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BE **SEMESTER : V**
BRANCH: PRODUCTION **SESSION : MO/17**

SUBJECT: PE5005 STATISTICAL QUALITY CONTROL

TIME: 3. Hours **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) With the help of neat diagram explain the optimal level of total quality cost [2]

Q.1(b) Define quality of design and quality of conformance? Explain the factors which influences the quality of design. [4]

Q.1(c) What do you understand by dispersion? Discuss the various measures of dispersion. [6]

Q.2(a) Interpreter the below mentioned Process Capability Index conditions: [2]
1) When C_{pk}=0, the process mean is exactly equal to one of the specification limits.
2) When C_{pk}<0 then the process mean lies outside the specification limit.
3) When C_{pk}<1 then the entire process lies outside the specification limits.
4) Cpk > 1, Capable at 3σ

Q.2(b) With the help of neat diagrams explain type-I error and type-II error in control charts. How these errors can be reduced? Name the control chart which is used to identify the chance cause of variation. [4]

Q.2(c) A Production manager of a BKT tire company has inspected the number of defective tires in five random samples with 20 tires in each sample. The table below shows the number of defective tires in each sample of 20 tires. Calculate the control limits and draw appropriate control chart. [6]

Sample No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
No. of defectives	3	2	1	2	1	3	3	2	1	2	3	2	2	1	1	2	4	3	1	1

Q.3(a) What is acceptance sampling? What are the advantages and limitations of acceptance sampling? [2]

Q.3(b) With the help of a diagram explain the effect of the Sample Size and the Acceptance Number in a OC curve. [4]

Q.3(c) For the sampling plan N = 1500, n = 150, c = 3, construct the average outgoing quality curve. What is the AOQL? Interpret it. [6]

Q.4(a) Discuss the relative advantages and disadvantages of single, double, and multiple sampling plans. [2]

Q.4(b) A double sampling plan is desired that has a producer's risk of 0.05 at AQL = 1.8% nonconforming and a consumer's risk of 0.10 at LQL = 8.5% nonconforming. The lot size is 1500, and the sample sizes are assumed to be equal. Find the sampling plan if the producer's stipulation is to be satisfied exactly. Find the average sample number for lots that are 1.8% nonconforming. [4]

Q.4(c) What are standard sampling plans? Discuss MIL STD 105E switching procedure for normal, tightened, and reduced inspection. [6]

Q.5(a) Define reliability. Explain its role in quality control and improvement. [2]

Q.5(b) Capacitors in an electrical circuit have a time-to-failure distribution that can be modeled by the Weibull distribution with a scale parameter of 400 hours and a shape parameter of 0.2. What is the reliability of the capacitor after 600 hours of operation? Find the mean time to failure. Is the failure rate increasing or decreasing with time? [4]

PTO

Q.5(c)	For the system with three components (A, B, and C) in parallel determine the system reliability for 2000 hours of operation, and find the mean time to failure. Assume that all three components have an identical time-to-failure distribution that is exponential, with a constant failure rate of 0.0005/ hour. What is the mean time to failure of each component? If it is desired for the system to have a mean time to failure of 4000 hours, what should the mean time to failure be for each component?	[6]
Q.6(a)	What are the main objectives of quality circle?	[2]
Q.6(b)	What is cost of quality? Explain the various components of cost of quality.	[4]
Q.6(c)	What is ISO 9000? How it gives strategic advantage to the companies?	[6]
Q.7(a)	Enumerate phases to achieve TQC.	[4]
Q.7(b)	Discuss how a good quality product and services can help companies in improving their competitiveness?	[4]
Q.7(c)	Briefly discuss the important points of Deming's philosophy.	[4]

:::::04-12-2017 E:::::