Exam Date & Time: 13-Jan-2024 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIFTH SEMESTER B.TECH END SEMESTER MAKEUP EXAMINATIONS, JAN 2024

TOTAL QUALITY MANAGEMENT [MME 3158]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) How do you define Total Quality Management? Discuss the benefits of TQM. (2)

A)

B) Describe briefly the six basic techniques of performance measure presentation. (3)

C) The table below shows the frequency distribution of certain quality characteristic of a product: (5)

Characteristic value (mm)	Frequency
5.5	3
8.5	7
11.5	12
14.5	18
17.5	20
20.5	35
23.5	42
26.5	30
29.5	15
32.5	8
35.5	5
38.5	3

(i) Compute $\bar{X}$ and s.

(ii) If a normal distribution has these values for μ and σ, what percentage of the distribution would fall between the limits 9 mm and 30 mm?

2) Sketch and explain the Process flow diagram with an example. (3)

A)

B) Explain the seven steps to Strategic planning with reference to any business organization. (3)

C) Control chart for $\bar{X}$ and s have been run on a certain process for a long period of time . The subgroup size is 8. Assume an aimed-at mean $\bar{X}_0$ of 25.750 cm and a known standard deviation σ of 0.005 cm. (4)

(i) Calculate the central lines and control limits for $\bar{X}$ and s control charts.

(ii) Compute the probability of Type I error with regard to $\bar{X}$ chart.

(iii) On a particular run of this process, the actual mean is 25.755 cm. Find the probability of not detecting the shift in the mean.

3) Discuss the Documentation phase in the implementation of Quality management system in any product or service sector organization. (3)

A)

B) Explain Tchebycheff's and Camp-Meidell inequality theorems with examples. (3)

C) Two hundred solid state electronic device were tested to determine the failure rate of these units. Testing was conducted for 1000 hours with four units failing after 430, 580, 660, 930 hours respectively.

(i) Assuming a constant failure rate, calculate the total unit hours (item hours) on test where failed units are immediately replaced.

(ii) Calculate the total unit hours on test where failed units are not replaced.

(iii) Considering the total unit hours on test as computed in part (ii), what is the probability that one of these units survive for a required 520 hours of operation?

(4)

4) Discuss the applications of QFD tool. How the voice of the customer is captured by the QFD team? (3)

A)

B) Explain:

(i) Precision of method of measurement

(ii) Average Outgoing Quality Limit

(iii) Average Sample Number

(3)

C) A Single sampling plan is as follows: $n = 20$, $c = 3$. Compute the probability of acceptance of lots of 2%, 6%, 10% and 12.5% defective. Assume lot size is very large in comparison with sample size. (4)

5) Sketch and explain the Process Decision Program Chart (PDPC) with an example. (4)

A)

B) Describe the construction of *np* and *c* charts. Give three examples each for *np* and *c* control statistics. (3)

C) The table below contains the inspection data which shows the number of rejects found in each of the 20 lots of size 50 items each.

Lot number	Number of rejects	Lot number	Number of rejects
1	6	11	4
2	4	12	15
3	7	13	10
4	13	14	9
5	8	15	3
6	14	16	8
7	12	17	4
8	9	18	21
9	8	19	5
10	6	20	10

(3)

(i) Compute 3-sigma control limits for a *p* chart and state whether the process is under control.

(ii) If the cause for out of control situation was eliminated, recommend the control limits for future use of the *p* chart.

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