SANT LONGOWAL INSTITUTE OF ENGINEERING AND TECHNOLOGY

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Question Bank

Subject: Production Management

Subject Code: ME-314

DEPARTMENT OF MECHANICAL ENGINEERING

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For ICD Program

Question Bank

Subject Code: ME-314 **Subject Name: Production Management**

MCQ (112)

1. Quality is _____ variability.
   a) opposite of
   b) proportional to
   c) reciprocal of
   d) synonym of

2. Quality of a product is at its lowest when ____ quality component is neglected while it's manufacturing.
   a) performance
   b) reliability
   c) aesthetics
   d) serviceability

3. Which one of these is a dimension of quality?
   a) Performance
   b) Hazard rate
   c) Process Capability
   d) Control limits

4. Quality characteristics are classified into variables and _____
   a) constants
   b) attributes
   c) standards
   d) specifications

5. Performance of a product is _____
   a) how long the product lasts
   b) how easy it is to repair the product
   c) how often the product fails
   d) whether the product is capable of doing the intended job

6. Read the following sentences and choose the correct option.
   (i) Variables can only take discrete values while Attributes can take continuous values.
   (ii) Variables can only take continuous values while Attributes take discrete value.
   (iii) Attributes and variables are dependent on each other.
   (iv) Width of an impeller blade is a variable but no. of defective blades in a lot is an attribute.
   a) (i) and (iii) are correct
   b) (i)and (iii) are incorrect
   c) Only (i) is correct
   d) (i), (ii), (iii) and (iv)

7. Which one of these is not a component of quality?
   a) Reliability
   b) Durability
   c) Acceptance sampling
   d) Serviceability

8. Which one of these is physical CTQ characteristic?
   a) Length
   b) Appearance
   c) Reliability
   d) Color

9. How is the aesthetics of a product defined as?
   a) How good the product performs its job
   b) How good it looks
   c) How fast the job of the product is completed
   d) Whether the product is made exactly as the designer intended

10. What does CTQ characteristic mean?
    a) Close to quality characteristic
    b) Comparison to quality characteristic
    c) Consumer to quality characteristic
    d) Critical to quality characteristic

11. What does reduced variability result in?
    a) Increased failure rate

12. Specifications are defined as _____
    a) desired measurements of CTQ characteristics of

b) Decreased reliability
c) Fewer repair claims
d) Increased repair costs

13. Length of a rectangular box is _____
a) a continuous measurement, i.e. a variable
b) a discrete measurement, i.e. an attribute
c) a continuous measurement, i.e. an attribute
d) a discrete measurement, i.e. a variable

whole product
b) actual measurements of CTQ characteristic of whole product
c) difference from desired measurements of CTQ characteristic of the components of product
d) desired measurements of CTQ characteristics of the product components

14. If the fraction nonconforming for 7 samples are 0.11,0.24,0.21,0.14,0.24,0.21,0.17, what is the value for the center line for a p-chart?
a) 0.19
b) 0.21
c) 0.12
d) 0.13

15. Quantities that can be numerically measured, can be plotted on a _____ control chart.
a) X bar
b) P chart
c) C chart
d) np chart

16. If a process is said to be in control, what can we say about the variation?
a) Random
b) Normal
c) Attribute
d) Assignable

17. A single measureable quality characteristic, such as dimension, weight, or volume, is called _____
a) Variable
b) Attribute
c) Variable and an Attribute
d) Mean and variablility

18. Tolerances are said to be _____
a) limits of natural variability
b) Statistical limits of variability
c) Limits determined by the customers of the product
d) Limits of inherent process variability

19. A variable quality characteristic will have both _____
a) Mean and variability
b) Discrete and continuous values
c) Zero and infinite value
d) One or zero

20. Upper control limit for a x chart is expressed by _____
a) $\bar{x}+A2R$
b) $\bar{x}-A2R$
c) $\bar{x}+A2\bar{R}$
d) $\bar{x}+A3R$

21. Control of the process average or mean quality level is usually done with the _____ control chart.
a) X bar control chart
b) S control chart
c) R chart
d) P chart

22. The center line for a $\bar{x}$ chart denotes _____
a) Mean of any sample
b) Mean of means of the sample
c) Mean of any sample + 0.5
d) (Mean of any sample) / 0.5

23. S chart is used to monitor _____ of a quality characteristic.
a) Mean
b) Range
c) Variability
d) Attributes

24. Specifications have the same meaning as _____
a) Control limits
b) UCL
c) LCL
d) Tolerances

25. Toughness of a bolt mount on a tank is _____
a) An attribute
b) A variable
c) Variable and an attribute
d) Variability

26. For a random variable having a normal distribution, the ratio of its range to the standard deviation is called _____
a) Relative range
b) Absolute range
c) Major range
d) Minor range

27. X chart is a _____
a) Attribute control chart
b) Variable control chart
c) Neither a variable control chart nor an attribute control chart
d) Falls in the category of both variable and attribute control charts

28. Process variability can only be described and monitored by the s control chart.
a) True
b) False

29. The lower control limit for an x bar control chart is lesser than the mean of means of the samples taken.
a) True
b) False

30. For any process, the sample ranges are, 1.2,1.5,1.1,1.4,1.5. The subgroup size is 5. What will be the process standard deviation? Given: d_2=2.326 and A_2=0.577
a) 0.576
b) 2.322
c) 0.511
d) 2.463

31. LCL for the R chart is given by _____
a) D_3 R
b) D_2 R
c) R – D_3 R
d) d_2 R

32. A tolerance diagram is also called _____
a) Scatter diagram
b) Defect concentration diagram
c) Histogram
d) Tier chart

33. In the general equation of UCL of a control chart, for any x chart, which of these is used as the estimator of μ?
a) $\bar{x}$
b) $\bar{R}$
c) $\bar{\bar{x}}$
d) $\bar{\bar{R}}$

34. Is there any relationship between specification limits and control limits of x and R charts?
a) Yes, Specification limits = Control limits
b) Yes, Control limits=Specification limits/2
c) No
d) Yes, Control limits*0.5 = Specification limits

35. Which of these gives the correct value of A_2 used in the equation for control limits of a x control chart?
a) 3d2n√
b) 3n√
c) 3d2
d) 3d2√

36. Control limits are _____
a) Limits defined by customers
b) Limits driven by the natural variability of the process
c) Limits driven by the inherent variability of the process
d) Statistical limits

37. In phase I application of x and R chart, the control limits obtained from the equations are treated as _____
a) Final limits
b) Trial limits
c) Warning limits
d) Pattern limits

38. The natural variability of the process is measured by _____
a) Process mean
b) Sample standard deviation
c) Process standard deviation
d) Sample mean

39. Which term is having a closest meaning as Sampling Distributions?
a) Control charts
b) On site inspection
c) Whole lot inspection
d) Acceptance sampling

40. What type of chart will be used to plot the number of defectives in the output of any process?
a) x bar chart
b) R chart
c) c chart
d) p chart

41. Process capability generally uses _____
a) Specifications
b) Control Limits
c) Process standard deviation
d) Mean of any one sample

42. Process standard deviation is necessarily equal to the sample standard deviation of the same process.
a) True
b) False

43. The process standard deviation is given by _____
a) R/d_2
b) Rd_2
c) $1/d_2$
d) R/d

44. "There is no need of revision of control limits once calculated by the equations of control limits.
a) True
b) False

45. Once a set of reliable control limits is obtained, we use the control chart for monitoring future production. This is called _____
a) Phase I control chart usage
b) Phase II control chart usage
c) Phase III control chart usage
d) Phase IV control chart usage

46. The control limits obtained by specifying the type I error level for the test, are called _____
a) Probability limits
b) Trial limits
c) Error limits
d) Unreliable limits

47. When R chart is out of control, we _____
a) Eliminate the out-of-control points and recalculate the control limits
b) Take one more sample and recalculate the control limits
c) Eliminate the out-of-control points and the nearest two points, and recalculate the control limits
d) Take no action

48. Which chart should be interpreted first when both, x chart, and R chart are indicating a non-random behavior?
a) x chart
b) R chart
c) X and R chart
d) Trial Limits

49. When the upper and lower natural tolerance limits are equal to the upper and lower specification limits, the process capability ratio, c_p is _____
a) Greater than 1
b) 0
c) Less than 1
d) Equal to 1

50. Which of these is a cause of trend patterns on a control chart?
a) Gradual wearing out of some critical process component
b) Operator fatigue
c) Environmental changes
d) Over-control

51. X bar chart monitors _____
a) Between-sample variability
b) Within-sample variability
c) Neither between-sample nor within-sample variability

52. Shift in process level can be seen on the control charts when _____
a) Operator fatigue occurs
b) Temperature changes
c) Over-control of process
d) New workers introduction

d) Both between-sample variability and within-sample variability

53. 5. Unlike x chart, which measures between-sample variability only, an R chart is used to monitor ____
a) Both between-sample variability and within-sample variability
b) Within-sample variability only
c) Between-sample variability only
d) Neither between-sample variability nor within-sample variability

54. Stratification is defined as _____
a) Tendency for the points to cluster artificially around the center line
b) Shift in the process level
c) Continuous movement of points in one direction
d) When the points fall near or slightly outside the control limits

55. When using standard values of process mean and standard deviation, the equation of UCL for a x chart is given as, UCL = $\mu+A\sigma$ What is the value of A here?
a) $6/\sqrt{n}$
b) $3/\sqrt{n}$
c) $\sqrt{n}/6$
d) $\sqrt{n}/3$

56. Stratification of points on a control chart indicates _____ of natural variability of the process.
a) Lack
b) Increase
c) Constancy
d) Randomness

57. For standard values of mean and standard deviation used, what does the center line of the R chart represent?
a) R bar
b) $d_2\ \sigma$
c) $D_2\ \sigma$
d) $d_2\ R$

58. Never attempt to interpret the x chart when the R chart indicates the out of control condition.
a) True
b) False

59. Once a set of reliable control limits is obtained, we use the control chart for monitoring future production. This is called _____
a) Phase I control chart usage
b) Phase II control chart usage
c) Phase III control chart usage
d) Phase IV control chart usage

60. The 3 sigma limits on x bar control charts imply that the type I error probability is _____
a) 0.0012
b) 0.0072
c) 0.0027
d) 0.0037

61. The assumption that links normality to the control charts is _____
a) The underlying distribution of the quality characteristic is normal
b) The normal mean will be equal to the process mean
c) The normal distribution is not the correct distribution for all the quality characteristic
d) Every distribution is a part of normal distribution

62. If the means for sample 1 to 4 for a process are, 12.67, 22.32, 14.53, 12.11; what value will be the center line of x chart indicating?
a) 15.2
b) 15.4
c) 14.8
d) 14.9

63. The probability of not detecting “an in-control shift” of the mean of the process is said to be the _____
a) α – Risk
b) β – Risk

64. A permanent change in the sample size is made only because of cost or because has exhibited good stability and fewer resources are allocated for process monitoring.
a) True
b) False

c) γ – Risk
d) δ – Risk

65. If the sample size is 7 and the Average run length is 122 for a process, what will be the expected number of the individual units sampled?
a) 850
b) 854
c) 867
d) 844

66. Which of these should be plotted on the x bar chart?
a) Counts
b) Defects
c) Problems Solved
d) Measurements

67. If β- risk of any process is 0.75, what will be the ARL for that process?
a) 4
b) 1.33
c) 0.86
d) 2

68. If the probability of one point plotting out of control limits of a X bar control charts is 0.0143, what will be its expected number of individual units sampled with subgroup size 8?
a) 559
b) 544
c) 530
d) 580

69. Slope of OC curve for x bar chart will _____ when sample size is increased.
a) Decrease
b) Increase
c) Remain same
d) Decrease then increase

70. A mixture pattern in the control chart points is exhibited when _____ occurs.
a) Operator fatigue
b) Change of raw materials
c) Continuous wear of tool
d) Adjustments too often responding to random variation

71. The assumption that links normality to the control charts is _____
a) The underlying distribution of the quality characteristic is normal
b) The normal mean will be equal to the process mean
c) The normal distribution is not the correct distribution for all the quality characteristic
d) Every distribution is a part of normal distribution

72. What is done when there is a sample plotted out of control limits for a p-chart?
a) The sample is investigated for an assignable cause and then the sample data is eliminated to develop a new p-chart
b) The sample is only investigated for an assignable cause
c) The sample is not investigated at all (It is assumed that there was no assignable cause present)
d) All the samples are investigated

73. What is the estimator of standard deviation in the x bar and R charts?
a) Mean of one sample
b) Mean of whole process
c) Range
d) Process capability ratio

74. The center line of the s chart denotes ____
a) Standard deviation of the process
b) Mean of m number of standard deviations, where m is the number of samples
c) c_4 s
d) B_5 s

75. What does “s” denote in x bar and s charts?
a) Sample

76. What is the value of LCL for the s chart when the standard value for σ is not given?

b) Sample standard deviation
c) Process standard deviation
d) Statistics

77. What is an unbiased estimator of unknown variance of a probability distribution?
a) Sample mean
b) Sample standard deviation
c) Sample variance
d) Sample range

78. What is the value of B_3 in the terms of c_4?
a) $C_4-3\sqrt{(1-C^2_4)}$
b) $C_4+3\sqrt{(1+C^2_4)}$
c) $1-3c4\sqrt{(1-c24)}$
d) $1-c43\sqrt{(1-c24)}$

79. What is the standard formula of sample variance?
a) $\sum ni=1(xi-\bar{x})1/2n-1$
b) $\sum ni=1(xi-\bar{x})2n-1$
c) $[\sum ni=1(xi-\bar{x})2n-1]1/2$
d) $\sum ni=1(xi-\bar{x})2n$

80. What is the formula for UCL for x bar chart when s is known?
a) $UCL=\bar{\bar{x}}+A3\bar{s}$
b) $UCL=\bar{\bar{x}}-A2\bar{s}$
c) $UCL=\bar{\bar{x}}-A3\bar{s}$
d) $UCL=\bar{\bar{x}}+A2\bar{s}$

81. Which of these formulas gives the exact equation for the UCL of s chart with a std. value for σ given?
a) $B_6\ \sigma$
b) $B_5\ \sigma$
c) $c_4\ \sigma$
d) $c_3\ \sigma$

82. For mean of all sample standard deviations=0.0094 and the sample size= 5, what will be the estimate of process standard deviation?
a) 100
b) 0.01
c) 0.0094
d) 94

83. The center line of the s chart with a standard value for σ given, denotes the value of _____
a) $B_6\ \sigma$
b) $c_4\ \sigma$
c) $B_5\ \sigma$
d) $c_5\ \sigma$

84. 14. Process standard deviation is the mean of all sample standard deviations.
a) True
b) False

85. If the sample standard deviations for a process are 1.567, 1.429, 1.323, 1.525, 1.989, 1.457, what will be the mean standard deviation?
a) 1.548
b) 1.858
c) 1.327
d) 1.967

86. X bar and R charts are highly favorable when the sample size is high.
a) True
b) False

87. What is the value of B_5 in the terms of c_4?
a) $C_4-3\sqrt{(1-C^2_4)}$
b) $C_4-3\sqrt{(1+C^2_4)}$
c) $C_4+3\sqrt{(1-C^2_4)}$
d) $C_4+3\sqrt{(1+C^2_4)}$

88. Which of this is a situation when x bar and s charts should be utilized instead of x bar and R charts?
a) When sample size is constant
b) When sample standard deviation is less than 1
c) When sample range is more than 1
d) When sample size is variable

89. When the sample size is variable, which one of these can be used to evaluate the value of x double bar?
a) $\sum mi=1nixi\bar{}\sum ni=1ni$
b) $\sum ni=1nixi\bar{}\sum mi=1ni$
c) $\sum ni=1nixi\bar{}\sum ni=1ni$
d) $\sum mi=1nixi\bar{}\sum mi=1ni$

90. What is the value of the center line of the sample variance control chart?
a) $s\bar{}2$
b) s^2
c) $s\bar{}$
d) $s2\bar{\ \ \ \ \ }$

91. Which one of these is correct to evaluate the mean standard deviation of the process samples?
a) $\bar{s}=\sum mi=1(ni-1)s2i\sum mi=1ni$
b) $\bar{s}=[\sum mi=1(ni-1)s2i\sum mi=1ni-m]2$
c) $\bar{s}=[\sum mi=1(ni-1)s2i\sum mi=1ni-m]1/2$
d) $\bar{s}=\sum mi=1(ni-1)s2i\sum mi=1ni-m$

92. Which of these is a name of s control chart?
a) s^2 Chart
b) Process standard deviation chart
c) σ Chart
d) σ^2 Chart

93. Which of these is taken as the sample size while estimating process standard deviation, where sample size is variable?
a) n_i; Which is the highest among all sample sizes
b) n_i; Which is the lowest among all sample sizes
c) $n_i=5$
d) n_i; Which is the most frequently occurring among all the sample sizes

94. X bar chart should be interpreted before s chart if both are indicating out of control situations.
a) True
b) False

95. The control charts based directly on the sample variance are called _____
a) s Control charts
b) σ^2 Control charts
c) s^2 Control charts
d) x Charts

96. X bar and S chart are more accurate in predicting out-of-control situations than the x bar and R charts, in the case of high sample size.
a) True
b) False

97. Defectives word has almost same meaning as _____
a) Conforming
b) Nonconforming
c) Non-defective
d) Un-conforming

98. The u charts are also called _____
a) The control chart for nonconformities
b) Control charts for fraction nonconforming
c) Control charts for conformities per unit
d) Control chart for process mean

99. Quality characteristics which are related to only conforming or non conforming products, are called _____
a) Attributes
b) Continuous characteristics
c) Discrete characteristics
d) Variables

10(The ratio of the number of nonconforming items in a population to total number of items in that population, is called _____
a) Fraction nonconforming
b) Fraction of nonconformities
c) Fraction of conformities per unit of product
d) Fraction of variability

101 The control chart which relates to the fraction of defective product produced by a manufacturing process, is called _____
a) The control chart for nonconformities
b) Control charts for fraction nonconforming
c) Control charts for conformities per unit
d) Control chart for process mean

10: The sample fraction nonconforming is expressed as _____
a) p^=2Dn
b) p^=D3n
c) p^=D2n
d) p^=Dn

103 The control chart for fraction nonconforming is also called _____
a) u chart
b) c chart

10⁴ The center line of control chart of fraction nonconforming represents the value equal to _____
a) Fraction nonconforming

c) p chart
d) R chart

105 The control chart designed to deal with the defects or nonconformities of a product, is called _____
a) p chart
b) c chart
c) R chart
d) s chart

107 The c charts are also called _____
a) The control chart for nonconformities
b) Control charts for fraction nonconforming
c) Control charts for conformities per unit
d) Control chart for process mean

109 The control charts used for the analysis of nonconformities per unit of a product, are called _____ charts
a) p
b) c
c) x
d) u

111 Variable control charts can also be applied on attributes but their efficiency will be less as compared to the attribute control charts.
a) True
b) False

b) Process mean
c) Process standard deviation
d) Sample mean

106 If there are 9 items defective in the sample size of 28, what will be the value that the fraction nonconforming chart, will represent?
a) 0.2971
b) 0.3214
c) 0.6328
d) 0.8172

108 If standards are not given, the estimate of the unknown fraction nonconforming of the process, is evaluated by formula _____
a) $\bar{p}=[\sum m-1i=1Di]m$
b) $\bar{p}=[\sum n-1i=1Di]mn$
c) $\bar{p}=[\sum mi=1Di]mn$
d) $\bar{p}=[\sum ni=1Di]mn$

110 The fraction nonconforming says the same thing as the term defects per unit.
a) True
b) False

112 The value of L=3 in the genera model of control limits for a Shewhart control chart, explains _____
a) There are 3 sigma limits taken
b) There are 3 quality characteristics
c) There are 6 quality characteristics
d) There are 6 sigma limits taken

Short Answer Questions (30)

1. What is quality control?
2. How does statistical process control help in quality control?
3. What are control charts used for?
4. Differentiate between $\bar{X}$ & R charts and $\bar{X}$ & s charts.
5. What are the key properties of control charts?
6. What is the purpose of a p-chart in quality control?
7. How does an np-chart differ from a p-chart?
8. What is a c-chart, and when is it used?

9. What does 100p chart represent?
10. Explain the importance of process capability in quality control.
11. What are the objectives of acceptance control?
12. How is hypothesis testing used in acceptance control?
13. What is lot-by-lot acceptance sampling?
14. Define Acceptable Quality Level (AQL).
15. What are acceptance procedures based on AQL?
16. How does sampling inspection differ from 100% inspection?
17. What are the key principles of Total Quality Management (TQM)?
18. How has quality improvement evolved over time?
19. What are ISO standards?
20. How does TQM contribute to continuous improvement?
21. What is the significance of demand planning?
22. Differentiate between qualitative and quantitative methods of demand forecasting.
23. What are the key types of forecasting methods?
24. Why is sales forecasting important in business management?
25. What are the principles of material handling?
26. Name three common material handling equipment.
27. What is the purpose of material requirement planning (MRP)?
28. Define Just-in-Time (JIT) purchasing.
29. What are the main objectives of materials management?
30. Explain the role of supply chain management in business operations.

Long Answer Questions (30)

1. Explain the concept of Statistical Process Control (SPC) and how it helps in maintaining product quality. Discuss its key tools.
2. What are $\bar{X}$ & R charts? Describe their construction and application in process control.
3. Define control limits and discuss their significance in quality control. How are control limits determined for $\bar{X}$ & s charts?
4. A production process has been monitored using an R-chart. The following data was collected from 5 samples, each containing 4 observations:

Sample	Measurement 1	Measurement 2	Measurement 3	Measurement 4
1	15.2	15.5	15.3	15.4

Sample	Measurement 1	Measurement 2	Measurement 3	Measurement 4
2	15.1	15.3	15.2	15.6
3	15.3	15.6	15.4	15.5
4	15.2	15.5	15.4	15.7
5	15.4	15.7	15.5	15.8

5. Calculate the $\bar{R}$ (average range) and estimate the control limits using D3 = 0 and D4 = 2.114 (for n = 4).
6. Differentiate between p-chart, np-chart, and c-chart. Explain their applications with suitable examples.
7. What is acceptance sampling? Discuss the importance of lot-by-lot acceptance sampling in quality control.
8. A batch of 10,000 units has an AQL of 2%**.** The sample size selected is 200 units. Find **the** maximum allowable defective units in the sample for accepting the lot.
9. Explain the concept of hypothesis testing in acceptance control. Describe its role in determining whether to accept or reject a lot.
10. Discuss different acceptance procedures based on AQL with examples.
11. Define Total Quality Management (TQM) and explain its key principles. How does it help in continuous improvement?
12. What are ISO standards? Explain the role of ISO 9000 in quality management.
13. Describe the evolution of quality improvement techniques from inspection-based quality control to modern TQM approaches.

13. Define sales forecasting and explain its importance in business decision-making. Discuss at least three forecasting methods.
14. The demand for a product over the past 5 months has been recorded as follows:

Month	Demand
1	120
2	135
3	140
4	150

Month	Demand
5	160

Using the simple moving average method (3-month period), forecast the demand for Month 6.

15. What is the difference between qualitative and quantitative methods of demand forecasting? Explain with examples.

16. What are the principles of material handling? Describe different types of material handling equipment with examples.
17. Define Material Requirement Planning (MRP). How does it help in inventory management?
18. A company uses 300 units of a material per week. The ordering cost is ₹500 per order, and the carrying cost per unit per year is ₹50. If the lead time is 2 weeks, determine:

    - Economic Order Quantity (EOQ)
    - Reorder Point, Assume 52 weeks per year.

19. What is Just-in-Time (JIT) purchasing? Discuss its benefits and challenges in modern supply chain management.
20. What are the different types of business organizations? Compare sole proprietorship, partnership, and corporation in terms of ownership, liability, and management
21. Define forecasting. Discuss the applications of forecasting.
22. What are the factors affecting forecasting?
23. List and explain the types of forecasting in decision making.
24. What are the types of demand pattern? Explain them with suitable sketches.
25. Discuss the steps of Delphi method.
26. Given below is a series of weekly demand data that the Beta Company collected on one of its products and forecasts for the corresponding weeks, made by a forecast method which the company is testing. (a) Compute the mean absolute deviation based on all six weeks of data. (b) Compute the mean squared error based on the six weeks data.

Week	1	2	3	4	5	6
Demand	142	181	144	174	192	176
Forecast	155	157	159	161	163	165

27. A firm uses simple exponential smoothing with a = 0.3 to forecast demand. The forecast for the first week of January was 500 units, whereas actual demand turned out to be 450 units. (a) Forecast the demand for the second week of January. (b) Assume that the actual demand during the second week of January turned out to be 550 units. Forecast the demand up to February third week, assuming the subsequent demands as 475, 450, 470, 525, and 470 units.

28. The Super Snow paint shop has recorded the demand for a particular colour during the past 6 weeks as shown below.

Week	Demand in Litre
1st Week May	19
2nd Week May	17
3rd Week May	22
4th Week May	27
1st Week June	29
2nd Week June	33

(a) Calculate a 3-week moving average for the data to forecast demand for the next week.

(b) Calculate a weighted average forecast for the data, using a weight of 0.6 for the most recent data and weights of 0.3 and 0.1 for successive older data.

29. The details of sales turnover of a Cement Company for the period 2004-2010 are given in the following table. Compute the estimated sales for the year 2011.

Year	2004	2005	2006	2007	2008	2009	2010
Sales (in Crores)	30	40	55	68	95	90	120

30. Beta company has the following sales pattern during 2002 to 2010. Compute the sales forecast for 2011.

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sales (in Lakhs)	8	10	13	25	35	39	45	50	60