



**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

**End Semester Examination, May 2020**

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**Course: TQM AND VALUE ENGINEERING**

**Semester: 8th**

**Program: B.Tech.(Mechanical) and B.Tech.(Mechanical+Splz)**

**Time 03 hrs.**

**Course Code: IPEG 431**

**Max. Marks: 100**

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**SECTION A (30 X 1 = 30)**

**Multiple choice questions:**

1. What is the primary objective of Quality Circle?
  - a. Keep employees occupied
  - b. Higher profit
  - c. Self and mutual development of employees
  - d. To solve the problem
2. Which one of the following is not a typical feature of TQM?
  - a. Customer driven quality
  - b. Continuous Improvement
  - c. Action based on facts, data & analysis
  - d. Strong inspection oriented establishment
3. Control chart is a
  - a. Process monitoring tool
  - b. Process control tool
  - c. Both (a) and (b)
  - d. None of the above
4. Which of the following is responsible for quality objective?
  - a. Top level management
  - b. Middle level management

- c. Frontline management
  - d. All of the above
5. The role of management is to
- a. provide Resources
  - b. define EMS
  - c. monitor the effectiveness of the system
  - d. All of the above
6. Taguchi's quality loss function is based on a
- a. binomial distribution.
  - b. negative exponential distribution.
  - c. quadratic equation.
  - d. linear equation
7. The Taguchi method includes three major concepts. These include all of the following, except
- a. target-oriented quality.
  - b. quality loss function.
  - c. quality robustness.
  - d. employee involvement
8. Using the terminology of statistical control, the variation outside the control limits on an X-bar or range chart
- a. is viewed as uncontrollable.
  - b. is assumed to have been caused by special or assignable causes.
  - c. indicates that the system is probably out of control.
  - d. Both 2 and 3.
9. One type of error a manager can make is to blame a worker for an undesirable variation that is caused by the system. Refer to this as a type I error. Another type of error a manager can make is to blame the system when a worker caused the undesirable variation. Refer to

this as a type II error. If a company changed the basis for the upper and lower limits on a control chart from three standard deviations to two standard deviations

- a. the number of type I errors would increase.
- b. the number of type II errors would increase.
- c. the number of both types of errors would increase.
- d. the number of both types of errors would decrease.

10. Using the terminology associated with statistical process control (SPC), the variation within a stable system is

- a. Predictable within a range of values.
- b. Controllable.
- c. In control.
- d. a and c.

11. Using the terminology of statistical process control (SPC), Type I errors are where common cause variation is treated as assignable cause variation. Type II errors are where assignable cause variation is treated as common cause variation. Which of the situations below would minimize type II errors?

- a. Use SPC charts where the limits are based on 3 standard deviations.
- b. Use SPC charts where the limits are based on 2 standard deviations.
- c. Use SPC charts where the limits are based on 1 standard deviation.
- d. Use budget comparisons against actual results without using the concept of SPC.

12. When using the SPC methodology, a system is said to be stable when

- a. the system is efficient.
- b. the mean and range of variation caused by the system are controllable.
- c. the mean and range of variation caused by the system are predictable.
- d. the performance of the system is improving.

13. Which of the situations below would minimize type I errors?

- a. Use SPC charts where the limits are based on 3 standard deviations.
- b. Use SPC charts where the limits are based on 2 standard deviations.
- c. Use SPC charts where the limits are based on 1 standard deviation.
- d. Use budget comparisons against actual results without using the concept of SPC.

14. Conceptually, process control requires

- a. standards.
- b. a stable system.
- c. statistically established limits.
- d. b. and c.

15. A predictable range of variation in the output of a particular worker occurs on a routine basis. This variation represents

- a. common cause variation and is uncontrollable.
- b. common cause variation and is controllable.
- c. assignable cause variation and is uncontrollable.
- d. assignable cause variation and is controllable.

**Fill in the blanks:**

- 16. \_\_\_\_\_ is a planning tool used to fulfill customer expectations.
- 17. While setting Quality objective, \_\_\_\_\_ to be considered.
- 18. Reliability of product means \_\_\_\_\_.
- 19. \_\_\_\_\_ is a family of standards related to environmental management that exists to help organization.
- 20. \_\_\_\_\_ is one of the major techniques of cost reduction and cost prevention.

**True/False:**

- 21. PDCA cycle was defined by Edward Deming.
- 22. Shifting of mean value in SPC is type I error.
- 23. Pareto chart tool implementation helps in prioritizing the defects.

24. ISO 14001 is known as a generic management system standard relevant to any organization seeking to improve and manage resources more effectively.
25. Quality Audits examine the elements of a quality management system in order to evaluate how well these elements comply with quality system requirements.

**Match the following:**

- |                                   |  |
|-----------------------------------|--|
| 26. Quality management System     | a. Productivity quality – cost -Delivery |
| 27. Quality approach              | b. ISO 14000                             |
| 28. Pillar of TQM                 | c. Employee                              |
| 29. Environment Management System | d. Continual improvement management      |
| 30. TQM focuses on                | e. ISO 9000                              |

**SECTION B (5 X 10 = 50)**

1. Explain the stages of quality control in Taguchi's quality loss function.

**OR**

What are the criteria for BUY and MAKE decision?

2. Explain any 2 quality management tools.
3. Explain the structure of quality circle with its features.
4. The reliabilities of A, B, and C are 0.95, 0.92, and 0.90, respectively. Find the reliability of the system with three components (A, B, and C) in parallel.
  - a. Determine the system reliability for 2000 hours of operation, and find the mean time to failure.
  - b. 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?
  - c. 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?

5. (a) The diameter of cotter pins produced by an automatic machine is a characteristic of interest. Based on historical data, the process average diameter is 15 mm with a process standard deviation of 0.8 mm. If samples of size 4 are randomly selected from the process:
- (i) Find the  $1\sigma$  and  $2\sigma$  control limits. (ii) Find the  $3\sigma$  control limits.

- (b) The length of industrial filters is a quality characteristic of interest. Thirty samples, each of size 5, are chosen from the process. The data yields an average length of 110 mm, with the process standard deviation estimated to be 4 mm
- (i) Find the  $1\sigma$  and  $2\sigma$  control limits.  
(ii) Find the  $3\sigma$  limits.

### SECTION C (1 X 20 = 20)

1. a. Describe the PDCA cycle in context with ISO 14000.
- b. A company has extra capacity that can be used to produce a sophisticated fixture which it has been buying for Rs. 900 each. If the company makes the fixtures, it will incur materials cost of Rs. 300 per unit, labour costs of Rs. 250 per unit, and variable overhead costs of Rs. 100 per unit. The annual fixed cost associated with the unused capacity is Rs. 10,00,000. Demand over the next year is estimated at 5,000 units. Would it be profitable for the company to make the fixtures?

**OR**

- a. Differentiate EMS and QMS w.r.t ISO 14000 and ISO 9000.
- b. Find the following:
- Break even sales quantity
  - Break even sales
  - If the production quantity is 30,000, what are the margin of safety and contribution? Fixed cost = Rs. 10,00,000/-, Variable cost/unit = Rs. 50/- and Selling cost/unit = Rs 100/-.