ESE-2018 PRELIMS TEST SERIES

Date: 14th October, 2017

GS–Test 3 (OBJECTIVE SOLUTION)...

ANSWERS

1.	(a)	21.	(c)	41.	(c)	61.	(a)	81.	(a)
2.	(c)	22.	(a)	42.	(d)	62.	(d)	82.	(b)
3.	(a)	23.	(c)	43.	(a)	63.	(d)	83.	(c)
4.	(b)	24.	(d)	44.	(b)	64.	(d)	84.	(d)
5.	(d)	25.	(d)	45.	(b)	65.	(c)	85	(c)
6.	(d)	26.	(c)	46.	(d)	66.	(b)	86.	(d)
7.	(d)	27.	(a)	47.	(c)	67.	(d)	87.	(a)
8.	(c)	28.	(b)	48.	(a)	68.	(c)	88.	(d)
9.	(c)	29.	(d)	49.	(d)	69.	(d)	89.	(b)
10.	(b)	30.	(d)	50.	(c)	70.	(b)	90.	(c)
11.	(c)	31.	(d)	51.	(b)	71.	(d)	91.	(d)
12.	(b)	32.	(a)	52.	(c)	72.	(d)	92.	(d)
13.	(b)	33.	(c)	53.	(b)	73.	(c)	93.	(a)
14.	(c)	34.	(d)	54.	(d)	74.	(d)	94.	(a)
15.	(d)	35.	(b)	55.	(c)	75.	(d)	95.	(d)
16.	(b)	36.	(b)	56.	(a)	76	(c)	96.	(c)
17.	(d)	37.	(a)	57.	(b)	77.	(d)	97.	(a)
18.	(b)	38.	(b)	58.	(b)	78.	(b)	98.	(d)
19.	(a)	39.	(a)	59.	(b)	79.	(c)	99.	(d)
20.	(b)	40.	(a)	60.	(b)	80.	(a)	100.	(d)

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36. (b)

$$C_{PK} = \frac{\text{Min}\left[(USL - \bar{X}), (\bar{X} - LSL)\right]}{3\sigma}$$

$$USL = 47$$

$$LSL = 39$$

$$\bar{X} = 41.5$$

$$C_{PK} = \frac{\text{Min}\left[(47 - 41.5), (41.5 - 39)\right]}{3 \times 0.92}$$

$$= \frac{\text{Min}[5.5, 2.5]}{3 \times 0.92} = \frac{2.5}{3 \times 0.92}$$

$$CP_K = 0.91$$

37. (a)

C_P index is not able to recognize the lack of centering in the process.

This drawback of the C_P index is rectified in the other capability index, C_{PK} which is defined as

$$C_{PK} = \frac{\text{Distance between process center and the nearest specification}}{3\sigma}$$

$$= \frac{\text{Min}[(USL - \mu), (\mu - LSL)]}{3\sigma}$$

where USL = upper specification limit

LSL = lower specification limit

μ = Process mean

σ = Process deviation

38. (b)

No. of work station n = 5

Total work constant = $T_{WC} = \sum_{i=1}^{N} T_{i\,N}$

= 12 + 14 + 13 + 11 + 16 = 66 min

Cycle time $T_C \geq$ max(12, 14, 13, 11, 16)

T_C = 16 min

$$\text{Balance delay} = \frac{nT_C - T_{WC}}{nT_C}$$

$$= \frac{5 \times 16 - 66}{5 \times 16}$$

= 17.5%

39. (a)

Maximum station time $(T_{si})_{max}$ = 12 min

$$\text{Smoothness index} = \sqrt{\sum_{i=1}^{n}\left[(T_{si})_{max} - T_{si}\right]^2}$$

$$= \sqrt{(12-8)^2 + (12-9)^2 + (12-8)^2 + (12-10)^2 + (12-12)^2}$$

$= 6.7 \approx 7$

42. (d)

Risk for producer (α) = 0.2

Probability of acceptance

= 1 − α

= 1-0.2 =0.8

Probability of rejection at RQL (β) = 0.25

43. (a)

Type I error takes place when the process is in control but the QC manager is trying to find some assignable causes. This error leads to wastage of efforts, time, and money to find an assignable cause which in fact does not exist.

44. (b)

Taguchi is known for applying a concept called design of experiments to product design. This method is an engineering approach that focuses on developing robust design that enables products to perform better under varying conditions..

Kaoru Ishkawa proposed the concept of cause and effect diagram.

45. (b)

"Risk priority number" (RPN), is the product of ratings for severity (S), occurrence (O), and detectability (D).

RPN = S × O × D

RPN = 7*2*6

= 84

46. (d)

DMAIC refers to a data-driven improvement cycle used for improving, optimizing and stabilizing business processes and designs. The DMAIC improvement cycle is the core tool used to drive Six Sigma projects.

49. (d)

Job shop production is characterized by manufacturing of one or few quantity of products designed and produced as per the specification of customers within prefixed time and cost. The distinguishing feature of this is low volume and high variety of products.

50. (c)

- Kanban is scheduling system for just-in-time (JIT) production
- Kanban is a system to control the logistical chain from a production point of view, and is not an inventory control system (i.e. zero inventory)

51. (b)

C_p cannot be negative, C_{pk} can take negative values if the process center is outside the specification limits

53. (b)

As already mentioned, p-chart and np-chart are used to control numbers of defectives in a sample, whereas c-chart are used to control total defects in a unit when subgroup sizes are constant. u-chart is used to control the average number of defects per unit when subgroup sizes are constant or variable.

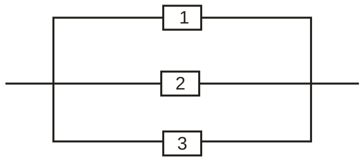
54. (d)

Pareto chart visually depicts the relative importance of problems or conditions. Pareto analysis is a statistical technique in decision making that is used for the selection of a limited number of tasks that produce a significant overall effect. Pareto effect also operates in the domain of quality improvement. According to the Pareto effect, 80% of the problems usually stem from 20% of the causes. This is also termed as the theory of the vital few and the trivial many.

55. (c)

Histograms provide a simple graphical view of accumulated data, including its dispersion and central tendency. It reveals the shape of the dispersion thus giving information how the process is distributed. Further comparing Histogram of two different process or machine can help to determine which process or machine is producing items closer to their target value and how distributed is the quality characteristic in question. Closer the data to the target value and narrower the distribution implies better process or machine performance.

85. (c)



System Reliability

$$R_s = 1-(1-R_1)(1-R_2)(1-R_3)$$
$$= 1-(1-0.8)(1-0.8)(1-0.8)$$
$$R_s = 0.99$$

86. (d)

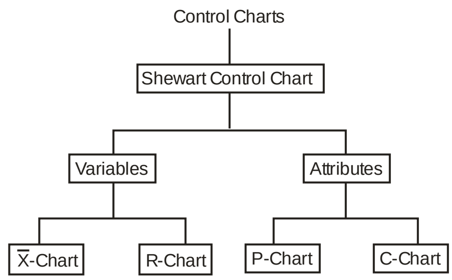
System Reliability

$$R(t) = R_A(t) \times R_B(t) \times R_E(t)$$
$$R(t) = 0.7 \times 0.7 \times 0.7 = 0.34$$

87. (a)

Benchmarking is another quality improvement to improve the performance of an organization by comparing the practices of a successful organization, i.e., it is an opportunity to learn from the experience of others.

88. (d)



90. (c)

Type-I or alpha errors occur when a point falls outside the control limits even though no special cause is operating. This results in a witch hunt for special causes and adjustment of things. The tampering usually distorts a stable process as well as wastes time and energy.

Type-II or beta errors occur when you miss a special cause because the chart isn't sensitive enough to detect it. In this case, you will go along unaware that the problem exists and thus will be unable to root it out.

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