U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

July 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Industrial Engineering and Management **Duration: 3 hrs.**
Course Code: 22IM5PCQAR **Max Marks: 100**
Course: Quality Assurance and Reliability

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

				CO	PO	Marks
			UNIT - I			
1	a)		One of the simplest definition of Quality is "Quality is inversely proportional to variability" Elucidate this definition with at least two examples related to product or process quality.	*CO1*	*PO1*	**06**
	b)		Highlight the importance of statistical methods for quality improvement with the help of any two examples of your own.	*CO1*	*PO1*	**08**
	c)		Give two examples of sporadic quality problems and two examples of chronic quality problems. Why is this classification of causes of quality problems or issues important?	*CO1*	*PO1*	**06**
			UNIT - II			
2	a)		Outline the activities involved for setting up the Quality Assurance processes and systems by considering the example of a small machine shop with CNC Machining Capabilities. Why do you think the systems for Quality Assurance is important from the point of view of clients or customers which are served by this CNC Machine shop?	*CO1*	*PO1*	**10**
	b)		Highlight the features of the ISO 9000 series of standards. List any five clauses of the ISO 9000 Quality Systems Standards. List the main benefits of Implementing ISO 9000 Standards by considering a Manufacturing plant making automotive components as a case example.	*CO1*	*PO1*	**10**
			OR			
3	a)		Distinguish between Chance Causes of Variation and Assignable Causes of variation. Give any two examples of chance causes and any two examples of assignable causes by considering the machining operations on the conventional lathe. Justify why the focus in SPC is on the elimination of the assignable causes of variation and allowing the system to operate under the influence of chance cause system.	*CO2*	*PO4*	**10**

		b)	List any five reasons for the popularity of control charts in the industries across the globe. What are the significance of action limits and warning limits? Why are three sigma limits preferred for action limits? What level of sigma limits are preferred for warning limits? Why?	*CO2*	*PO1*	**10**
			UNIT - III			
	4		Samples of n = 6 items each are taken from a process at regular intervals. A quality characteristic is measured, and Xbar and R values are calculated for each sample. After 50 samples, we have $\sum_1^{50} Xbar = 2000$ and $\sum_1^{50} R = 200$ Assume that the quality characteristic is normally distributed. (i) Compute control limits for the Xbar and R control charts. (ii) All points on both control charts fall between the control limits computed in part (ii). What are the natural tolerance limits of the process? (iii) If the specification limits are 41 ± 5.0, what are your conclusions regarding the ability of the process to produce items within these specifications? (iv) Assuming that if an item exceeds the upper specification limit it can be reworked and if it is below the lower specification limit it must be scrapped, what percent scrap and rework is the process producing? (v) Make suggestions as to how the process performance could be improved. (You are required to diagrammatically depict all the limits that you have computed and use this to develop your answers)	*CO3*	*PO2*	**20**
			OR			
	5	a)	A fraction nonconforming control chart with n=400 has the following parameters; UCL= 0.0809, Center line= 0.050, LCL= 0.0191 i. Find the width of the control limits in standard deviation units. ii. What would be the corresponding parameters for an equivalent control chart based on the number non conforming? iii. What is the probability that shift in the process fraction non confirming to 0.0300 will be detected in the first sample following the shift?	*CO3*	*PO2*	**10**

		b)	A control chart is to be established on a process producing refrigerators. The inspection unit is one refrigerator,and a control chart for non conformities is to be used. As per preliminary data 16 non conformties were counted in inspecting 30 refrigerators. i. What are the three sigma control limits? ii. What is the α-risk for this control chart? iii. What is the β-risk if the average number of defects is actually two (i.e ,if c = 2.0)?	*CO3*	*PO2*	**10**
			UNIT - IV			
	6	a)	Bring out the differences between 100% inspection and Sampling inspection.	*CO1*	*PO1*	**04**
		b)	Define the following terms clearly i. AQL ii. LTPD iii. Producer's risk iv. Consumer's risk	*CO1*	*PO1*	**04**
		c)	Suppose that a single-sampling plan with n = 150 and c = 2 is being used for receiving inspection where the supplier ships the product in lots of size N = 3000. (i) Draw the OC curve for this plan. (ii) Draw the AOQ curve and find the AOQL. (iii) Draw the ATI curve for this plan.	*CO1*	*PO1*	**12**
			UNIT - V			
	7	a)	Define the following terms clearly i. Reliability. ii. MTBF. iii. Failure rate.	*CO1*	*PO1*	**06**
		b)	Write briefly about the common failure rate curve. Identify clearly the three regions in the Bath tub curve. What are the probable causes of failures in each of these regions? How do you prevent these failures in each of the regions of the failure rate curve?	*CO1*	*PO1*	**06**
		c)	Let a parallel system be composed of n = 2 identical components each with Failure rate λ = 0.01 and mission time T = 10 hours, only one of which is needed for system success. Calculate the reliability of the system. Also compute the MTTF of the system.	*CO1*	*PO1*	**08**

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