Model Question Paper

(2018 Scheme)

USN | | | | | | | | | | |

Fifth Semester B.E. Degree Examination

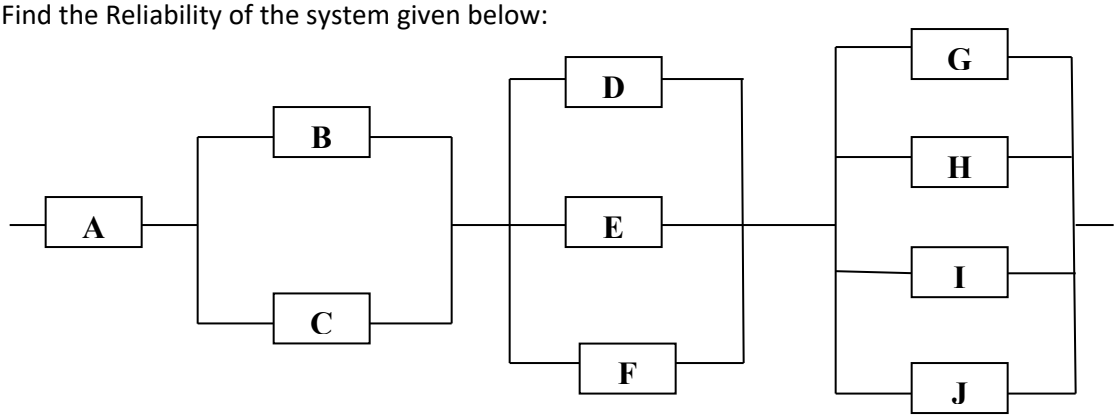
18IP53: Quality Assurance and Reliability

TIME: 03 Hours **Max. Marks: 100**

Note: Answer any one full question from each module

<table>
<tr><th colspan="3">Module - 1</th><th>Marks</th></tr>
<tr><td rowspan="3">Q.01</td><td>a)</td><td>Define Quality. List and explain the Five quality characteristics with examples</td><td>07</td></tr>
<tr><td>b)</td><td>What is quality of Conformance? What factors influence it?</td><td>06</td></tr>
<tr><td>c)</td><td>Distinguish between cost of quality and value of quality. How do you balance them?</td><td>07</td></tr>
<tr><td colspan="4">OR</td></tr>
<tr><td rowspan="3">Q.02</td><td>a)</td><td>What is a quality audit? Explain the scope of a quality audit.</td><td>07</td></tr>
<tr><td>b)</td><td>What factors influence the frequency of quality audit?</td><td>06</td></tr>
<tr><td>c)</td><td>Define a quality budget? List and briefly explain the three stages of preparing a quality budget.</td><td>07</td></tr>
<tr><td colspan="4">Module – 2</td></tr>
<tr><td rowspan="3">Q. 03</td><td>a)</td><td>Distinguish clearly between chance causes and assignable causes of variation, with examples.</td><td>06</td></tr>
<tr><td>b)</td><td>Distinguish clearly between variables and attributes giving examples</td><td>04</td></tr>
<tr><td>c)</td><td>Ten aircraft wings are inspected for non conforming welds. The number of non-conforming welds per wing ranged from 26 to 55. The total number of non-conforming welds after inspection was 360. Compute the control limits for an appropriate control charts and comment on the status of control.</td><td>10</td></tr>
<tr><td colspan="4">OR</td></tr>
<tr><td rowspan="3">Q.04</td><td>a)</td><td>What is a control chart? What are its objectives?</td><td>06</td></tr>
<tr><td>b)</td><td>Explain the probability distribution governing the control chart for defects.</td><td>04</td></tr>
<tr><td>c)</td><td>The following are the inspection results of defective castings produced in 10 days. Calculate the average fraction defective and 3sigma control limits for a control chart. Construct the control chart and find the status of control.
<table>
<tr><td>Day</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>No. of Castings produced</td><td>154</td><td>152</td><td>148</td><td>150</td><td>154</td><td>145</td><td>151</td><td>154</td><td>150</td><td>153</td></tr>
<tr><td>No. of defective castings</td><td>4</td><td>2</td><td>2</td><td>4</td><td>3</td><td>4</td><td>2</td><td>2</td><td>1</td><td>4</td></tr>
</table></td><td>10</td></tr>
<tr><td colspan="4">Module – 3</td></tr>
<tr><td rowspan="2">Q. 05</td><td>a)</td><td>What is a Runsum test? Explain briefly with a neat sketch</td><td>06</td></tr>
<tr><td>b)</td><td>Control charts for X bar and R are to be maintained for a process which is known to have a standard deviation of 0.08 units and aimed at mean of 32 units. Subgroup size is 5.</td><td></td></tr>
</table>

		(i) Determine the control chart limits for both the charts (ii) Determine the capability of the process assuming the process to be under statistical control (iii) If the process is used to meet the specification of 32±0.15, what is your conclusion? (iv) If the process is used to meet the specification of 32±0.51, what is your conclusion?	**14**
		OR	
Q. 06	a)	Distinguish clearly between defects and defectives giving examples	**06**
	b)	Control chart for X bar and R are to be maintained for a part which has the specification of 2.05±0.02 mm. The sample size is 4. The values of sum of X bar and Sum of R after 20 subgroups are 41.283mm and 0.28mm respectively. Compute the trial control limits for X bar and R charts. If the process is in control, what can you tell about the capability of this process to meet the given specifications? How to improve the situations?	**14**
		Module – 4	
Q. 07	a)	Using a neat sketch explain an item by item Sequential Sampling Plan	**08**
	b)	A double sampling plan has the following specifications (with the usual notations); N = 5000; n_1 = 40; n_2 = 60; c_1= 0; c_2 = 3; p = 1%; Compute: (i) Probability of Acceptance P_a (ii) ATI (iii) If the rejected lots are 100% inspected, what is AOQ?	**12**
		OR	
Q. 08	a)	Explain the characteristics of OC curves, using neat sketches	**08**
	b)	Draw the OC Curve of a single sampling plan with the following specifications (With the usual notations). Lot size is very large compared to sample size. n =100; c = 4; Determine Producer's risk = α and consumer's risk = β, if AQL =1.5% and LTPD = 6%	**12**
		Module – 5	
Q. 09	a)	The dimensions of two mating parts A and B are normally distributed with the averages of 250mm and 251mm respectively. The corresponding standard deviations are 0.1mm and 0.3mm. If the parts are assembled at random, what percentage of assemblies will have positive clearance?	**08**
	b)	A measuring instrument consists of two sub-assemblies A and B connected in series having respective probabilities of 0.90 and 0.92. The minimum reliability of the instrument must be at 0.917. Determine how many units of A must be connected in parallel to unit B so as to achieve the required system reliability.	**07**
	c)	What is standby redundancy? Explain with an example.	**05**
		OR	
Q. 10	a)	A rod is made up of 5 sections. The first and last sections have a mean length of 25.025mm, while the middle three sections have a mean of 49.975mm. The standard deviation of each section is 0.01mm. Compute: (i) The average total length of the assembly (ii) The standard deviation of the assembly (iii) The probability of the assembly length exceeding 200mm.	**08**

	b)	Find the Reliability of the system given below:  Given: R(A) = 0.7; R(B) = R(E) = R(G) = R(J) = 0.86; R(I) = R(C) = 0.65; R(F) = R(D) = R(H) = 0.76	12

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Fifth Semester B.E. Degree Examination

18IP53: Quality Assurance and Reliability

TIME: 03 Hours **Max. Marks: 100**

Note: Answer any one full question from each module

		Module - 1	Marks
Q.01	a)	What is a quality function? With a neat sketch explain the Juran's quality Spiral.	**07**
	b)	What is quality of design? What factors influence it?	**06**
	c)	What are quality costs? How are they classified as per ASQC? Explain briefly.	**07**
		OR	
Q.02	a)	Define quality assurance. List and explain the three stages of achieving quality assurance.	**07**
	b)	What are the different contents included in a quality audit?	**06**
	c)	List and briefly discuss the four types of quality organizations used in industries.	**07**
		Module – 2	
Q. 03	a)	With neat sketches explain the 3 possible cases of relationship between specification tolerance (USL-LSL) and Natural tolerance (Process Capability).	**06**
	b)	Explain the probability distribution governing the control chart for defectives.	**04**
	c)	The data below shows the average number of outlet leaks per radiator for 10 lots of 100 radiators each. Construct an appropriate control chart and comment on the status of control.	**10**

Lot Number.	1	2	3	4	5	6	7	8	9	10

Leaks per radiator	15	17	12	16	14	5	14	11	9	10

OR

Q.04	a)	List the generally found patterns of control charts and describe any one type in detail.	**06**
	b)	What is a variation? Explain the fundamental factors contributing to variation.	**04**
	c)	From the following data, compute the trial control limits for an appropriate control chart. Construct the control chart and give suggestions for future.	**10**

Sample No	1	2	3	4	5	6	7	8	9	10
No. of defectives	10	12	8	9	11	8	10	11	9	12
No. of inspected items	90	110	90	100	130	100	80	110	110	80

Module – 3

Q. 05	a)	Distinguish between Universe parameters and Sample parameters. How are they related?	**06**
	b)	Control chart for X bar and R have been maintained for 25 subgroups of size 5 of a certain product. The universe process average is 124 and mean is 5 units. The specification set for the process is 119±10. If the process is in statistical control, compute the following: (i) Control limits for X bar and R chart (ii) Process capability (iii) Is the process able to meet the given specification? (iv) How to improve the situation?	**14**

OR

Q. 06	a)	Distinguish between type I and type II errors in control charts.	**06**
	b)	In the manufacturing of precision pins, five pins are taken at a time and the following data is obtained.	**14**

Sample No.	1	2	3	4	5	6	7	8	9	10
X bar	50.04	50.24	50.14	50.08	50.28	50.16	50.30	50.10	50.16	50.10
R	0.07	0.08	0.03	0.05	0.04	0.09	0.04	0.04	0.05	0.07

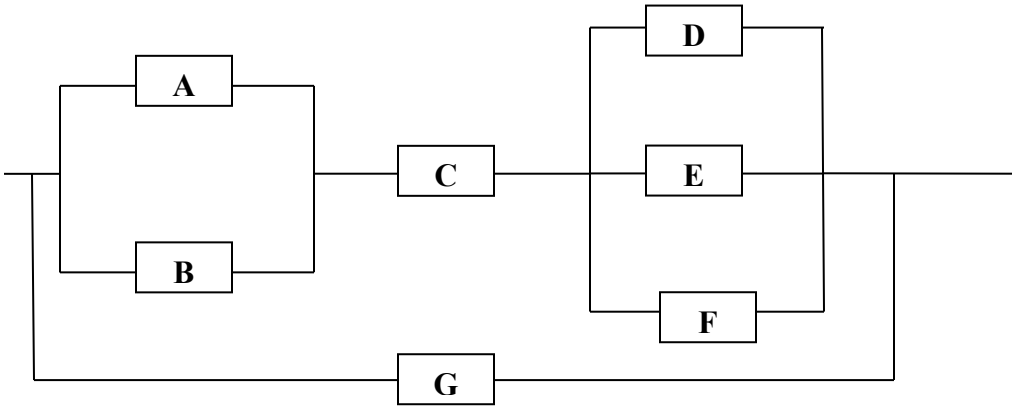
(i) Determine the control limits of X bar and R charts
(ii) Plot both the control charts and comment on the status of control
(iii) Compute the process capability

Module – 4

Q. 07	a)	Represent a Double sampling plan using a flow chart	**06**
	b)	Draw the OC Curve of a single sampling plan with the following specifications (with the usual notations): N = 10,000; n = 150; c = 2; Determine Producer's risk = α and consumer's risk = β, if AQL =1% and LTPD = 4%	**14**

OR

Q. 08	a)	What are OC curves? Sketch an OC curve indicating its salient parameters.	**06**

	b)	A double sampling plan has the following specifications (with the usual notations): N=50,000; n_1=150; n_2=100; c_1=0; c_2=1; p= 1%; Compute: (ii) Probability of Acceptance P_a (ii) ATI (iii) AFI (iv) ASN	**14**
Module – 5			
Q. 09	a)	Two mating parts P and Q have an average clearance specified as 0.06mm. Control charts indicate the standard deviations of the dimensions of P and Q AS 0.03mm and 0.04mm respectively. Find the probability of interference between the mating parts assuming normal distribution for all the dimensions.	**07**
	b)	Starting from the basics derive an expression for Reliability of component, R(t) = $e^{-\lambda t}$	**07**
	c)	Compare Parallel redundancy with standby redundancy. Which is better? Why?	**06**
		OR	
Q. 10	a)	A circuit contains three resistors in series. The mean and standard deviation of the resistors are 125 Ω, 200 Ω, 600 Ω and 3 Ω, 4 Ω, 12 Ω respectively. Determine the percentage of circuits meeting the specifications of 930±30 Ω.	**08**
	b)	Compute the reliability of the following system.  Given: R(A) = R(C) = 0.95; R(B) = R(D) = 0.90; R(E) = R(F) = 0.92; R(G) = 0.94	**12**