

# Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam – 603 110

(An Autonomous Institution, Affiliated to Anna University, Chennai)

Department of Mathematics

Continuous Assessment Test – III

Question Paper

Degree & Branch	B.E/B.Tech - CSE & IT	Semester	01
Subject Code & Name	UMA1478 & Probability and Statistics		
Date: 01.06.2022 Time: 90 Minutes	Answer All Questions	Maximum: 50 Marks	

## Part – A ( $6 \times 2 = 12$ Marks)




K1	1. Write the equations to calculate the residual in two-factor experiment.	CO4
K2	2. Compare RBD and LSD.	CO4
K2	3. State the basic principles of experimental design.	CO4
K2	4. Find LCL and UCL for p-chart and np-chart when $n = 150$ and $\bar{p} = 0.075$	CO5
K2	5. When the process is under control and if $n = 6$ , $\bar{X} = 2.1126$ , $\bar{R} = 0.0084$ , find the tolerance limits.	CO5
K1	6. Under what situations p-chart is drawn instead of np-chart?	CO5

## Part – B ( $3 \times 6 = 18$ Marks)

K3	<p>7. A completely randomized design experiment with 10 plots and 5 treatments gave the following results:</p> <table><tr><td>Plot No.</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>Treatment</td><td>A</td><td>B</td><td>C</td><td>A</td><td>C</td><td>C</td><td>A</td><td>B</td><td>A</td><td>B</td></tr><tr><td>Yield</td><td>5</td><td>4</td><td>3</td><td>7</td><td>5</td><td>1</td><td>3</td><td>4</td><td>1</td><td>7</td></tr></table>	Plot No.	1	2	3	4	5	6	7	8	9	10	Treatment	A	B	C	A	C	C	A	B	A	B	Yield	5	4	3	7	5	1	3	4	1	7	CO4
Plot No.	1	2	3	4	5	6	7	8	9	10																									
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Yield	5	4	3	7	5	1	3	4	1	7																									
K3	<p>8. In a factory producing spark plugs, the number of defectives found in the inspection of 15 lots of 100 each is given below. Draw the control chart for the number of defectives and comment on the state of control.</p> <table><tr><td>Sample No. (i)</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 Defective (np)</td><td>6</td><td>7</td><td>12</td><td>10</td><td>9</td><td>5</td><td>7</td><td>6</td><td>4</td><td>7</td></tr></table>	Sample No. (i)	1	2	3	4	5	6	7	8	9	10	No. of Defective (np)	6	7	12	10	9	5	7	6	4	7	CO5											
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No. of Defective (np)	6	7	12	10	9	5	7	6	4	7																									
K3	<p>9. Given below are the values of sample mean <math>\bar{X}</math> and sample range R for 10 samples, each of size 5. Draw the appropriate mean and range charts and comment on the state of control of the process.</p> <table><tr><td>Sample No.</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>Mean</td><td>43</td><td>49</td><td>37</td><td>44</td><td>45</td><td>37</td><td>51</td><td>46</td><td>43</td><td>47</td></tr><tr><td>Range</td><td>5</td><td>6</td><td>5</td><td>7</td><td>7</td><td>4</td><td>8</td><td>6</td><td>8</td><td>6</td></tr></table>	Sample No.	1	2	3	4	5	6	7	8	9	10	Mean	43	49	37	44	45	37	51	46	43	47	Range	5	6	5	7	7	4	8	6	8	6	CO5
Sample No.	1	2	3	4	5	6	7	8	9	10																									
Mean	43	49	37	44	45	37	51	46	43	47																									
Range	5	6	5	7	7	4	8	6	8	6																									

**Part – C (2 × 10 = 20 Marks)**

K4	<p>10. Three varieties of a crop are tested in a randomized block design with four replications, the layout being as given below: The yields are given in kilograms. Analyze for significance</p> <table><tr><td>C48</td><td>A51</td><td>B52</td><td>A49</td></tr><tr><td>A47</td><td>B49</td><td>C52</td><td>C51</td></tr><tr><td>B49</td><td>C53</td><td>A49</td><td>B40</td></tr></table>	C48	A51	B52	A49	A47	B49	C52	C51	B49	C53	A49	B40	CO4																																																																	
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K4	<p>11. 10 samples each of size 50 were inspected and the number of defectives in the inspection were :2,1,1,2,3,5,5,1,2,3. Draw the appropriate control chart for defectives</p>	CO5																																																																													
K4	<p>12. The following data resulted from an experiment to compare three burners <math>B_1, B_2, B_3</math>. A Latin square design was used as the tests were made on 3 engines and were spread over 3 days</p> <table><tr><td></td><td>Engine -1</td><td>Engine -2</td><td>Engine -3</td></tr><tr><td>Day -1</td><td><math>B_1 - 16</math></td><td><math>B_2 - 17</math></td><td><math>B_3 - 20</math></td></tr><tr><td>Day -2</td><td><math>B_2 - 16</math></td><td><math>B_3 - 21</math></td><td><math>B_1 - 16</math></td></tr><tr><td>Day -3</td><td><math>B_3 - 15</math></td><td><math>B_1 - 12</math></td><td><math>B_2 - 13</math></td></tr></table> <p>Test the hypothesis that there is no difference between burners.</p>		Engine -1	Engine -2	Engine -3	Day -1	$B_1 - 16$	$B_2 - 17$	$B_3 - 20$	Day -2	$B_2 - 16$	$B_3 - 21$	$B_1 - 16$	Day -3	$B_3 - 15$	$B_1 - 12$	$B_2 - 13$	CO4																																																													
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K4	<p>13. The specifications for a certain quality characteristics are <math>(60 \pm 24)</math> in coded values. The table given below gives the measurements obtained in 10 samples. Find the tolerance limits for the process and test if the process needs the specifications</p> <table><tr><td>Sample No. (i)</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>Measurements(X)</td><td>75</td><td>48</td><td>57</td><td>61</td><td>55</td><td>49</td><td>74</td><td>67</td><td>66</td><td>62</td></tr><tr><td></td><td>60</td><td>79</td><td>55</td><td>71</td><td>68</td><td>98</td><td>63</td><td>70</td><td>65</td><td>68</td></tr><tr><td></td><td>50</td><td>53</td><td>53</td><td>66</td><td>58</td><td>65</td><td>62</td><td>68</td><td>58</td><td>66</td></tr><tr><td></td><td>62</td><td>61</td><td>61</td><td>69</td><td>62</td><td>64</td><td>57</td><td>56</td><td>52</td><td>68</td></tr><tr><td></td><td>52</td><td>49</td><td>72</td><td>77</td><td>75</td><td>66</td><td>62</td><td>61</td><td>58</td><td>73</td></tr><tr><td></td><td>70</td><td>56</td><td>63</td><td>53</td><td>63</td><td>64</td><td>64</td><td>66</td><td>50</td><td>68</td></tr></table>	Sample No. (i)	1	2	3	4	5	6	7	8	9	10	Measurements(X)	75	48	57	61	55	49	74	67	66	62		60	79	55	71	68	98	63	70	65	68		50	53	53	66	58	65	62	68	58	66		62	61	61	69	62	64	57	56	52	68		52	49	72	77	75	66	62	61	58	73		70	56	63	53	63	64	64	66	50	68	CO5
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<p align="center">Prepared By</p> 	<p align="center">Reviewed By</p> 	<p align="center">Approved By</p> 
<p align="center">(Dr. R. Sundareswaran) ASP/ Maths</p>	<p align="center">(Dr. I. Jayakaran Amalraj) PAC Team</p>	<p align="center">(Dr. B. Praba) HOD-Maths</p>