THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. Degree Programme

ADU5319 – DESIGN AND ANALYSIS OF EXPERIMENTS

OPEN ELECTIVES - LEVEL 05

CONTINUOUS ASSESSMENT TEST II (NBT) - 2024/2025

Duration: One Hour

Date: 14.03.2025	**Time: 02.30 p.m- 03.30 p.m**

Answer all questions

Question 01

An industrial engineer wanted to conduct an experiment on eye focus time. He is interested in the effect of the distance of the object from the eye on the focus time. Four different distances are of interest. He has five subjects available for the experiment because there may be differences among individuals. The focus time data (in seconds) are given below:

Distance (ft)	**Subject**				
	1	**2**	**3**	**4**	**5**
4	10	6	6	6	6
6	7	6	6	1	6
8	5	3	3	2	5
10	6	4	4	2	3

Total sum of squares = 84.55

(i) Write down the hypotheses to be used.

(ii) Test whether that distance affects the eye focus time. Interpret your results.

(iii) Find out if any differences exist among subjects. Justify your answer.

Contd.,

Question 02

A researcher wants to study the effect of four diets (*A, B, C, D*) on weight gain (in kilograms) of cattle in a certain farm. It was believed that weight gain is affected by age of the animal and genetic factors. Animals were grouped by age and genetic factors. They were weighed at the beginning of the study period. Different diets were given to the animals for three months, and then they were re-weighed. The study plan and the weight gain over the three months are given below:

Genetic Group	Age Group				Total
	1	2	3	4	
1	5 (*A*)	7 (*B*)	4 (*C*)	3 (*D*)	**19**
2	10 (*B*)	8 (*A*)	5 (*D*)	5 (*C*)	**28**
3	7 (*C*)	5 (*D*)	6 (*A*)	12 (*B*)	**30**
4	10 (*D*)	11 (*C*)	15 (*B*)	12 (*A*)	**48**
Total	**32**	**31**	**30**	**32**	**125**

Total sum of squares = 180.44

Diet	*A*	*B*	*C*	*D*
total	31	44	27	23

(i) Identify the design used in this experiment. Justify your answer.

(ii) Construct the ANOVA table and test appropriate hypotheses. Interpret your results.

(iii) The estimated error variance in an RCBD with the age as blocks was 13.06. Which design do you prefer? Justify your answer.

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Appendix 4a

5 per cent Points of the *F*-distribution

Column represents degrees of freedom (ν_1) for numerator of *F*-test
Row represents degrees of freedom (ν_2) for denominator of *F*-test

	1	2	3	4	5	6	7	8	9	10	12	24	∞
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.9	249.1	254.3
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.45	19.50
3	10.13	9.552	9.277	9.117	9.013	8.941	8.887	8.845	8.812	8.785	8.745	8.638	8.526
4	7.709	6.944	6.591	6.388	6.256	6.163	6.094	6.041	5.999	5.964	5.912	5.774	5.628
5	6.608	5.786	5.409	5.192	5.050	4.950	4.876	4.818	4.772	4.735	4.678	4.527	4.365
6	5.987	5.143	4.757	4.534	4.387	4.284	4.207	4.147	4.099	4.060	4.000	3.841	3.669
7	5.591	4.737	4.347	4.120	3.972	3.866	3.787	3.726	3.677	3.637	3.575	3.410	3.230
8	5.318	4.459	4.066	3.838	3.688	3.581	3.500	3.438	3.388	3.347	3.284	3.115	2.928
9	5.117	4.256	3.863	3.633	3.482	3.374	3.293	3.230	3.179	3.137	3.073	2.900	2.707
10	4.965	4.103	3.708	3.478	3.326	3.217	3.135	3.072	3.020	2.978	2.913	2.737	2.538
11	4.844	3.982	3.587	3.357	3.204	3.095	3.012	2.948	2.896	2.854	2.788	2.609	2.405
12	4.747	3.885	3.490	3.259	3.106	2.996	2.913	2.849	2.796	2.753	2.687	2.505	2.296
13	4.667	3.806	3.411	3.179	3.025	2.915	2.832	2.767	2.714	2.671	2.604	2.420	2.206
14	4.600	3.739	3.344	3.112	2.958	2.848	2.764	2.699	2.646	2.602	2.534	2.349	2.131
15	4.543	3.682	3.287	3.056	2.901	2.790	2.707	2.641	2.588	2.544	2.475	2.288	2.066
16	4.494	3.634	3.239	3.007	2.852	2.741	2.657	2.591	2.538	2.494	2.425	2.235	2.010
17	4.451	3.592	3.197	2.965	2.810	2.699	2.614	2.548	2.494	2.450	2.381	2.190	1.960
18	4.414	3.555	3.160	2.928	2.773	2.661	2.577	2.510	2.456	2.412	2.342	2.150	1.917
19	4.381	3.522	3.127	2.895	2.740	2.628	2.544	2.477	2.423	2.378	2.308	2.114	1.878
20	4.351	3.493	3.098	2.866	2.711	2.599	2.514	2.447	2.393	2.348	2.278	2.082	1.843
21	4.325	3.467	3.072	2.840	2.685	2.573	2.488	2.420	2.366	2.321	2.250	2.054	1.812
22	4.301	3.443	3.049	2.817	2.661	2.549	2.464	2.397	2.342	2.297	2.226	2.028	1.783
23	4.279	3.422	3.028	2.796	2.640	2.528	2.442	2.375	2.320	2.275	2.204	2.005	1.757
24	4.260	3.403	3.009	2.776	2.621	2.508	2.423	2.355	2.300	2.255	2.183	1.984	1.733
25	4.242	3.385	2.991	2.759	2.603	2.490	2.405	2.337	2.282	2.236	2.165	1.964	1.711
26	4.225	3.369	2.975	2.743	2.587	2.474	2.388	2.321	2.265	2.220	2.148	1.946	1.691
27	4.210	3.354	2.960	2.728	2.572	2.459	2.373	2.305	2.250	2.204	2.132	1.930	1.672
28	4.196	3.340	2.947	2.714	2.558	2.445	2.359	2.291	2.236	2.190	2.118	1.915	1.654
29	4.183	3.328	2.934	2.701	2.545	2.432	2.346	2.278	2.223	2.177	2.104	1.901	1.638