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...Bastion of Knowledge...

OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2021 /2022 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE IN APPLIED STATISTICS

COURSE CODE: STA 320

COURSE TITLE: DESIGN AND ANALYSIS OF EXPERIMENT I

DATE: 2ND JUNE, 2022 **TIME: 1400 – 1700 HRS**

INSTRUCTION TO CANDIDATES

- **SEE INSIDE**

THIS PAPER CONSISTS OF 5 PRINTED PAGES   PLEASE TURN OVER

REGULAR – MAIN EXAM

STA 320: DESIGN AND ANALYSIS OF EXPERIMENT I

STREAM: BSC (Applied Statistics)   **DURATION: 3 Hours**

INSTRUCTIONS TO CANDIDATES

   i.   *Answer ALL questions from section A and ANY THREE Questions in section B.*

   ii.   *All questions in section B carry Equal Marks.*

   iii.   *Do not write on the question paper.*

SECTION A (31 marks): Answer ALL questions

QUESTION ONE (16MKS)

a) Fill in the linear additive model for the CRD for each of the observations below (6 Marks)

	Treatment 1	Treatment 2	Treatment 3	
	4	9	8	
	5	10	11	
	6	11	8	
$y_{i.}$				$y_{..} =$
$\bar{y}_{i.}$				$\bar{y}_{..} =$
$\bar{y}_{i.} - \bar{y}_{..}$				

b) Explain the meaning of the following in context of experimental design.   (5 Marks)

   (i) Extraneous variables;

   (ii) Confounded relationship;

   (iii) Control;

   (iv) Research hypothesis;

   (v) Treatments.

c) From the linear additive model for the CRD show that, *Total Sum of Squares = Treatment Sum of Squares + Error Sum of Squares*   (5 Marks)

QUESTION TWO   (15 Marks)

a) Briefly discuss 5 things that a research plan must contain   (5 Marks)

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b) Briefly elaborate the concept of fixed effects and random effect in Completely Randomized Design   (5 Marks)

c) List 3 informal experimental designs: (3 Marks)

d) Write two sets of null hypotheses and the alternatives that can be tested in Completely Randomized Design   (2 Marks)

SECTION B (39 MARKS, CHOOSE ANY THREE QUESTIONS)

QUESTION THREE (13 MARKS)

a) Discuss Completely Randomized Design then elaborate its advanteages and disadvantages

(5 Marks)

b) Below are given the plan and yield in kgs/plot of a 5x5 Latin square experiment on the wheat crop carried out for testing the effects of five. manorial treatments A, B, C, D, and E. 'A' denotes control.

B 15	A 8	E 17	D 20	C 17	R1 = 77
A 9	D 21	C 19	E 16	B 13	R2 = 78
C 18	B 12	D 23	A 8	E 17	R3 = 78
E 18	C 16	A 10	B 15	D 23	R4 = 82
D 22	E 15	B 13	C 18	A 10	R5 = 78

Analyze the data and state your conclusions.   (8 Marks)

QUESTION FOUR (13 Marks)

a) Explain and illustrate the following research designs   (5 Marks)

(i) Two group simple randomized design;

(ii) Latin square design;

(iii) Random replications design;

(iv) Simple factorial design

(v) Randomized block design (R.B. design)

b) Given the following Grain yield of rice at six seeding rate: (Mg/ha) below:

Rep	Seeding rate (kg/ha)						Y.j
	25	50	75	100	125	150	
1	5.1	5.3	5.3	5.2	4.8	5.3	31.0
2	5.4	6.0	5.7	4.8	4.8	4.5	31.2
3	5.3	4.7	5.5	5.0	4.4	4.9	29.8
4	4.7	4.3	4.7	4.4	4.7	4.1	26.9
Yi.	20.5	20.3	21.2	19.4	18.7	18.8	118.9
$\sum Y_{ij}^2$	105.35	104.67	112.92	94.44	87.53	89.16	594.07

i. Complete the ANOVA table below   (4 Marks)

SOV	Df	SS	MS	F
Rep	-	-	-	-
Trt	-	-	-	-
Error	-	-	-	
Total	-	-		

ii. Calculate Coefficient of Variation (CV)   (2 Marks)

iii. Calculate LSD   (2 Marks)

QUESTION FIVE (13 Marks)

a) Discuss three principles of experimental designs   (6 Marks)

b) Fill in the given table so the Experimental Error SS = 0.   (7 Marks)

Rep	Treatments				
	A	B	C	D	E
1	2	6	1	8	4
2	4				
3	1				
4	5				

QUESTION SIX (13 Marks)

Given the treatment data below with equal replication:

Replicate	Treatment			
	A	B	C	
1	23	42	47	
2	36	26	43	
3	31	47	43	
4	33	34	39	
y_i.	123	149	172	y. =444
$\sum Y_{ij}^2$	3,875	5,805	7,428	

i.	Write the hypotheses to be tested	(1 Marks)
ii.	Calculate the correction factor	(2 Marks)
iii.	Calculate the Total SS	(2 Marks)
iv.	Calculate the Treatment SS	(2 Marks)
v.	Calculate the Error SS	(2 Marks)
vi.	Complete the ANOVA table below	(2 Marks)

	Sources of variation	Df	SS	MS	F
Treatment		-	-	-	-
Error		-	-	-	
Total		-	-		

| vii. | Make conclusions on the Hypothesis | (1 Marks) |
| viii. | Calculate Coefficient of Variation (CV) | (1 Marks) |

QUESTION SEVEN (13 Marks)

Discuss the concept of Randomized Complete Block Design and elaborate 6 of its advantages and 3 disadvantages

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