

1

Solution

65055

S.O.B.Sc. (Sem 4). Paper-2 (Statistics) April 2019

Q.1) a) 1) False, Additive in nature

2) True

3) False, We have treatments & blocks

4) False, Error d.f. = 2

5) False

b) 1) Exper. Unit: The smallest division of the experimental material to which we apply the treatments and on which we make observations on the variable under study.

Exper. Error: The variations from plot to plot

which is due to random or chance causes ~~but~~ beyond human control are called as exp. error.

2)

CRD

RBD

• There is only one source of variation i.e. treat

• There are two sources of variations i.e. Treat. & blocks

• Based on principles

• Based on principles

Rando. & Repl.

Rand., Repl. & Local control

3) CRD Advantages :

4) Main effect due to factor B = [B]

$$= \frac{1}{8r} [-(1) - (a) + (b) + (ab) - (c) - (ac) + (bc) + (abc)]$$

[Divisor: 8r or 8

Where r: no. of replications.

5) Efficiency of LSD w.r.t CRD

$$= \frac{S_R^2 + S_C^2 + (m-1)S_E^2}{(m+1)S_E^2}$$

In one-way classification

Q.2) a) S.S. Treat (SST)

S.S. Error (SSE)

Total S.S. (TSS)

E(SST), E(SSE), E(TSS) } - (7)

b) In two-way class.

Model - (2), Assumptions - (02)

E = Error S.S. - (02)

$$\frac{\partial E}{\partial \mu} = 0 \text{ - (01)}$$

$$\frac{\partial E}{\partial \alpha_i} = 0 \text{ \& } \frac{\partial E}{\partial \beta_j} = 0 \text{ } \} \text{ (03)}$$

2

Contd Q2) c) In one-way classification we compare treatment mean effects. If treats show significant difference effects, we might be interested to test for the significance of the difference between any two treatment means

$$H_0: \mu_i = \mu_j \quad [i \neq j]$$

$$H_1: \mu_i \neq \mu_j$$

Test Statistic

$$t = \frac{\bar{y}_i - \bar{y}_j}{\sqrt{\frac{2s^2_E}{n}}}$$

$$\text{or } t = \frac{\bar{y}_i - \bar{y}_j}{\sqrt{\left(\frac{1}{n_i} + \frac{1}{n_j}\right) s^2_E}}$$

$$C.D = t_{\alpha/2, n-k} \sqrt{\frac{1}{n_i} + \frac{1}{n_j} s^2_E}$$

If  $|\bar{y}_i - \bar{y}_j| > C.D$  then Reject  $H_0$

Q3) a) Principles of DOE: Repl - (02)

Rand. - (02)

Local control - (02)

CRD: - Rand. & Repl., RBD - Rand., Repl. & Local control - (04)

b) CRD: Explanation - (02) Assumptions - (02)

Layout - (02) Parameters - (04)

Model - (02)

c) RBD: Description - (02), Layout - (04)

Advantages - (04)

Q4) a) LSD: - Description - (01)

Model - (02)

Tabular data, Notations, Various S.S., ~~Typ ANOVA~~ (07)

b) 2<sup>nd</sup> Fact. expt: Description & Notations - (09)

Yates' table - (02)

State-Model - (02)

Hypo & ANOVA - (04)

3

Contd. Q4. e) Missing value in RBD & Analysis — (10)

Q.5) a) i) ANOVA — (02), Use of ANOVA — (02)

ii) Model & explanation — (05)

b) Efficiency of RBD com CRD

$$\text{RBD: Total S-S} = (rt-1)\sigma_e^2 + (t-1)r\sigma_t^2 + (r-1)t\sigma_B^2 \quad \text{--- (02)}$$

$$\text{CRD: Total S-S} = (rt-1)\sigma_e^2 + (t-1)r\sigma_t^2 \quad \text{--- (02)}$$

$$\sigma_e^2 + \frac{(r-1)t\sigma_B^2}{(rt-1)} = \frac{1}{r}\sigma_e^2 \quad \text{--- (01)}$$

$$E = \frac{\frac{1}{r}\sigma_e^2}{\sigma_e^2} = 1 + \frac{t(r-1)}{(rt-1)} \frac{\sigma_B^2}{\sigma_e^2} \quad \text{--- (02)}$$

$$\Rightarrow E = \frac{(r(t-1)\sigma_e^2 + (r-1)\sigma_B^2}{(rt-1)\sigma_e^2} \rightarrow (03)$$

c) Description of Notations — (03)

Table of signs — (02)

Model & S-S, ANOVA table — (05)

(1) - ...

(2) ...

(3) ...

(4) ...

(5) ...

(6) ...

(7) ...

(8) ...

(9) ...

(10) ...