M.Sc.

4th Semester Examination - 2019

ZOOLOGY

Paper - ZOO 402

Full Marks : 40 Time : 2 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group - A

(Biostatistics)

1. Answer any *two* questions from the following : 2×2

(a) Write a short note on Kurtosis. 2

(b) What do you mean by "error of inference" ? 2

(c) What is model II regression ? 2

(d) Briefly explain "Types of Correlation". 2

[Turn Over]

2. Answer any *two* questions from the following : 2×4

(a) The product moment r scores (r_{12}) between gill weight (x_1 gms) and trunk length (x_2 cm) was found to be 0.55 in a sample of 43 *labeo rohita*; the r scores (r_{13}) between their gill weight (x_1 gms) and body weights (x_3 gms) amounted to 0.30; while r scores (r_{23}) between their trunk length (x_2 cm) and body weight (x_3 gms) was found to be 0.28. Find whether or not there is a significant multiple linear correlation between the combination of X_1 and X_2. $(\alpha = 0.01)$ 4

[Critical t values : $t_{0.01\ (42)} = 2.698$

$t_{0.01\ (41)} = 2.701$

$t_{0.01\ (40)} = 2.704$

(b) The following results were obtained from records of age (x) and systolic blood pressure (y) of a group of 10 teachers of Vidyasagar University.

Variable	Age (x)	Blood pressure (y)
Mean	53	142
Variance	130	165

$$\sum(x-\bar{x})(y-\bar{y})=1220$$

Find the appropriate regression equation and estimate the blood pressure of a teacher whose age is 50 years. 4

(c) The following data presents the yields of potato on ten subdivisions of equal area of two agricultural plots of Midnapore.

Plot A	5.6	5.7	5.8	6.0	6.1	6.2	5.6	5.7	5.8	6.2
Plot B	6.3	5.9	5.8	6.0	6.2	6.1	5.8	5.9	6.3	5.6

4

Test whether the two samples taken from two random population have the same variance.

(at 5% level $F_{(9\ \&\ 9)} = 3.18$)

(d) What is Normal distribution ? State the properties of normal distribution curve mentioning the area under the curve. 1+3

3. Answer *one* question from the following : 1×8

(a) 30 bypass patients are randomly divided into four treatment groups depending on medicine applied. Folic acid in red blood cells were measured. Is there any significant effect of medicine on red cell folate ?

[Turn Over]

Group - A : 12, 15, 10, 18, 11, 15, 12, 17, 21

Group - B : 21, 25, 19, 26, 27, 28

Group - C : 9, 8, 8, 7, 11, 10, 12

Group - D : 25, 30, 29, 31, 33, 27, 29, 30

[Critical F value at 5% level]

$F_{0.05\ (4, 30)} = 2.69$;

$F_{0.05\ (3, 26)} = 2.98$;

$F_{0.05\ (3, 27)} = 3.01$;

$F_{0.05\ (4, 27)} = 2.69$.

(b) (i) A couple is heterozygous for albinism (Aa). What is the probability that (a) 4 out of 6 children born to them are normal ? (b) 4 normal and 2 albino are produced out of 6 children ?

(ii) What do you mean by Fixed Model Anova ?

(iii) Write a short note on variance. 4+2+2

Group - B

(Developmental Biology)

4. Answer any *two* questions from the following : 2×2

(a) What happens if antibodies against Dickkopf protein is injected into the Xenopus blastocoel ? 2

(b) Which signals are being blocked to produce Xenopus head structure ? 2

(c) Why cultured mouse muscle cells lacking the Rb protein can reenter the cell cycle ? 2

(d) What is the function of sperm adhesion protein (SED1) in mamalian fertilization. 2

5. Answer *two* questions from the following : 2×4

(a) Why much time is needed to acquire head like inducing properties in hydra if amputation is made near the basal disc ? 4

(b) How newt cells recognize a discontinuity in positional value by grafting a distal blastema to a proximal stump in amphibia ? 4

[Turn Over]

(c) Describe the events following the activation of the enzyme NAD^+ kinase by calcium release in sea urchin egg. 4

(d) Describe the antagonistic relationship between bone morphogenesis protein 4 (BMP4) and the organizer. 4

6. Answer any *one* from the following : 1×8

(a) (i) What is primary embryonic induction ?

(ii) How maximum goosecoid expression is activated in Xenopus organizer ?

(iii) How Xenopus organizer is formed by the interaction of Xenopus nodal related (Xnr) protein and TGF-β factor ?

1+4+3

(b) (i) Why MAP kinase activity is regulated in sea urchin egg fertilization ?

(ii) Why cholesterol is removed during mammalian sperm capacitation.

(iii) What are the probable mechanism of egg activation in mammal (diagram to be given)

1+3½+3½