

**PG (NEW) CBCS**  
**M.Sc. Semester-IV Examination, 2019**  
**ZOOLOGY**  
**PAPER: ZOO-402**

(Biostatistics and Developmental biology)

**Full Marks: 40**

**Time: 2 Hours**

**Use separate Answer-scripts for Group-A & Group-B**

GROUP-A

Biostatistics

Marks-20

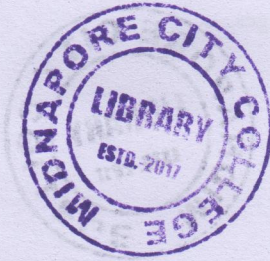
1. Answer any two questions from the following: 2×2=4
- a) Distinguish between type-I and type-II errors. 1+1
- b) Correlation coefficient between two variables is symmetric – what do mean by the statement? Cite an example wherein the determination of correlation coefficient has no practical significance. 1+1
- c) State at least four properties of normal distribution. 2
- d) State the gross algebraic relationship between the three common measures of central tendency. How do the objectives of t-test and ANOVA differ from each other? 2
2. Answer any two questions from the following: 2×4=8

- a) In a grass land, earthworm populations were sampled from 10 randomly selected plots of equal size. The following table shows the number of earthworms (n) collected from those 10 plots.

Plot:	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
n=	25	32	17	23	15	34	27	19	22	26

Examine the distribution pattern of earthworms [given that  $\chi^2(0.05) (9) = 16.92$ ].

4



(Turn over)



(2)

b) The mean score and s.d. for 16 boys in an aptitude test were found to be 40.3 and 8.15, respectively while the mean score and s.d. for 16 girls in the same aptitude test were found to be 37.5 and 6.35, respectively. Determine whether there is any significant difference between the mean scores of the boys and the girls [given that  $t_{(0.05)}(30) = 2.04$ ]. 4

c) A problem is given to A, B and C. The probability of getting the problem solved by them is  $\frac{1}{2}$ ,  $\frac{1}{3}$ , and  $\frac{1}{4}$ , respectively. Supposed, A, B and C are independently trying to solve the problem, find the probability of getting the problem solved by any of the three students. S 4

d) Find out the correlation coefficient between earthworm density ( $x$ ) and soil pH ( $y$ ) using the results of 15 observations, as stated below:  
 $\sum x = 106.4$ ,  $\sum y = 290$ ,  $\sum x^2 = 56947$ ,  $\sum y^2 = 1434.24$ ,  $\sum xy = 9024.40$  4

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

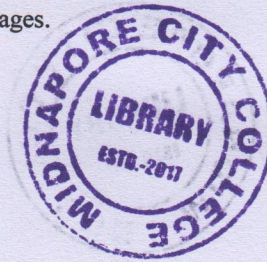
a) i) For 24 Tilapia, the following results were obtained in relation to body length ( $y$ ) in cm and body weight ( $x$ ) in gm.:

$$\sum x = 1165, \sum y = 185.20, \sum x^2 = 56947, \sum y^2 = 1434.24, \sum xy = 9024.40$$

Find out the appropriate regression equation and estimate the body length of a fish with a body weight of 50 gm. 5

ii) The correlation coefficient between body length and body weight of some fishes is 0.95. Test the significance of 'r' at 1% level of significance [given  $t_{0.01}(23) = 2.81$ ]. 3

b) i) The following data show the yields (in quintal) of paddy in 12 paddy fields of uniform size, belonging to three villages, after using three different varieties of fertilizers (a, b and c) in the three villages.



(Turn over)



(3)

Fertilizer a	Fertilizer b	Fertilizer c
25	20	24
22	17	26
24	16	30
21	19	20

Carry out a suitable statistical test to determine if there is any significant difference in the average yields of paddy in the three villages after using three different varieties of fertilizers?

Given that  $F$  at  $df(2, 9)$  at 5% level = 4.26.

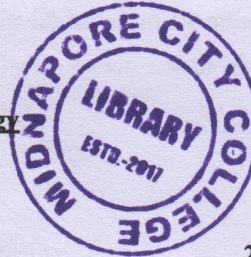
5

ii) The height of a group of 10,000 men shows normal distribution with mean height 64.5" and s.d. 4.5". Find out the number of men whose height is less than 55.5".

3

**Group-B**  
**Developmental biology**

Marks-20



4. Answer any two questions from the following:

2×2=4

- Name 3 major BMP blocker.
- Write the function of Bindin in fertilization of Sea-Urchin.
- In which area noggin and chordin mRNA is expressed?
- Why extra head formation in hydra is prevented during regeneration.

5. Answer any two questions from the following:

2×4=8

- Why does a muscle cells re-enter the cell cycle mechanism during limb regeneration in newt?
- What is Resact? How does it help in fertilization?
- How many major glycoproteins are found in zona pellucida? Briefly discuss their role in fertilization.

2+2

2+2

(Turn over)

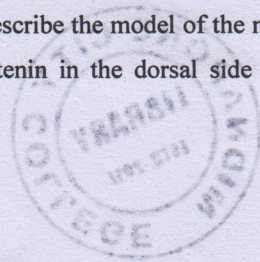


(4)

- d) How many major glycoproteins are found in zona pellucida? Briefly discuss their role in fertilization. 2+2
- e) What happens when Bone morphogenesis protein (BMP4) binds to cell membrane in xenopus? 4

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

- a) i) Briefly describe the possible mechanism of egg activation in Sea Urchin.  
ii) Discuss the role of G Protein in Src activation. 5+3
- b) Describe the model of the mechanism by which the disheveled protein stabilizes  $\beta$  catenin in the dorsal side (opposite to the sperm entry) of the amphibian egg. 8



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