· PH.D PROGRAMME IN LIFE SCIENCES

Term-End Examination

June,2014

COURSE TITLE: BIOSTATISTICS & COMPUTER APPLICATIONS IN BIOLOGICAL RESEARCH

COURSE CODE: RLS-003

Time : 3 hours   Maximum Marks : 100

Note: (i) Attempt any five questions.

(ii) Calculator is allowed.

1(a)   Calculate the mean incubation period of 9 polio cases given below: **(4+4+6+6)**

17, 20, 18, 24, 16, 19, 21, 22, 23

(b)   Systolic blood pressure (in mm of Hg) recorded in 8 male patients are given below. Calculate the median.

110, 100, 90, 120, 130, 140, 150, 160

(c)   Calculate the standard deviation of the respiration rate per minute which was found to be 16, 18, 19, 17, 21, 24, 22, 23, in 8 individuals.

(d)   In a series of 100 individuals, the mean blood glucose in mg/dl was found to be 155 with standard deviation 52. In the same group of individuals the mean serum cholesterol levels in mg/dl was found to be 210 with standard deviation 36. Determine which variable shows greater variation.

2(a)   We have a set of values of the test scores of 22 students in a class as   **(5+15)**

11, 2, 28, 33, 48, 0, 42, 17, 24, 14, 0, 18, 26, 29, 35, 42, 22, 8, 28, 8, 46, 14.

Draw a simple stem-and-leaf display by taking stem width 10.

(b)   Draw a box plot for the given data:

31, 42, 22, 27, 33, 27, 37, 28, 34, 44, 25, 39, 26, 31, 26, 33, 46, 48, 50

3   Consider the following natality statistics for Indian population in 1992. According   **(4+4+6+6)**
to these data, the probabilities that a randomly selected woman who gave birth in 1992 was in each of the following age group are as follow:

Age	<15	15-19	20-24	25-29	30-34	35-39	40-44	45-49	Total
Probability	0.003	0.124	0.263	0.290	0.220	0.085	0.014	0.001	1.000

(a) What is the probability that a woman who gave birth in 1992 was 24 years of age or younger?

(b)   What is the probability that she was 40 or older?

1

(c) Given that the mother of a particular child was under 30 years of age, what is the probability that she was not as yet 20?

(d) Given that the mother was 35 years of age or older, what is the probability that she was under 40?

4(a) Define sensitivity, specificity, positive predictive value and negative predictive value. **(8+12)**

(b) Dexamethasone suppression test (DST) is applied on 293 cases of depression and 207 healthy persons having no depression. The results of the test are shown below:

		Depression Status		
		YES (D^+)	No (D^-)	Total
Result of DST	T^+	114	6	120
	T^-	179	201	380
	Total	293	207	500

What is sensitivity and specificity of the test? Determine the positive and negative predictive value of the test. Also, interpret your results.

5(a) A drug is given to 8 patients and the increments in their blood pressure are recorded to be 4, 0, 7, −2, 0, −3, 2, 0. Assume that increment in their blood pressure follows normal distribution. Is it reasonable to believe that the drug has no effect on the change of blood pressure at 1% level of significance? **(10+10)**

(b) A medical researcher wishes to see whether the variance of the heart rates (in beats per minute) of smokers is greater than the variance of heart rates of people who do not smoke. Two samples are selected, and the data are shown as under:

Smokers   Nonsmokers
$n_1 = 26$ $n_2 = 18$

$S_1^2 = 26$ $S_2^2 = 18$

Using $\alpha = 0.05$, is there enough evidence to support the claim?

6(a) Out of 200 patients who are given a particular injection 180 survived. Test the hypothesis that the survival rate is 80% at 5% level of significance. **(10+10)**

(b) The following contingency table presents the analysis of 300 persons according to hair colour and eye colour:

Hair Colour	Eye Colour			
	Blue	Grey	Brown	Total
Fair	30	10	40	80
Brown	40	20	40	100
Black	50	30	40	120
Total	120	60	120	300

Test the hypothesis that there is an association between hair colour and eye colour at 1% level of significance.

7   15 bypass-patients are randomly divided into 3 treatment groups (different respiration). Data of folic acid in red blood corpuscles have been calculated for all groups which are given in the following table after coding: **(20)**

Group1	Group 2	Group 3
10	6	20
14	10	35
42	25	50
50	49	80
84	55	90

Test the value of folic acid differ in groups at 5% level of significance.

8.   The following data are entered in Excel Cells A1 to A6:   **(10+10)**

    100,135, 150, 104, 120, 105

Explain how the following functions will be performed in MS-Excel for the data given above. State all the steps involved in the process.

(a)   AVERAGE ( )

(b)   STDEV ( )

Some values for use, if required

Z-value	t-value	F-value	χ^2-value
$Z_{0.025} = 1.96$	$t_{(7),0.005} = 3.499$	$F_{(2,12),\,0.05} = 3.89$	$\chi^2_{(4),0.01} = 13.28$
$Z_{0.05} = 1.645$	$t_{(7),0.01} = 2.998$	$F_{(3,15),\,0.05} = 3.29$	$\chi^2_{(9),0.01} = 21.67$
$Z_{0.005} = 2.58$	$t_{(8),0.005} = 3.355$	$F_{(25,17),\,0.05} = 2.18$	$\chi^2_{(6),0.01} = 16.81$