MAY 2016.

Re. Biomed T.E VI (CBGS) Biomed

QP Code : 728101

(3 Hours) [Total Marks :80

N.B. : (1) Attempt any **four** questions. Each question is of **20** marks.
(2) Question number **1** is compulsory.
(3) **Scientific calculator** can be **used.**
(4) Appropriate **Statistical Tables** can be **used.**

1. (a) What is the chance that
(i) a leap year selected at random will contain 53 Sundays?
(ii) a non leap year selected at random will contain 53 Sundays?
(iii) November will have 5 Sundays?

(b) Given the normally distributed population with a mean of 75 and variance of 625 Find:
(i) $P(50 \leq x \leq 100)$
(ii) $p(x > 90)$
(iii) $p(x < 60)$

(c) The following table shows the number of hours 45 hospital patients slept following the administration of a certain anesthetic.

7	10	12	4	8	7	9	8	5	8
12	11	7	8	1	1	13	10	4	
4	5	5	8	7	3	2	3		
8	13	1	7	17	3	4	5	5	
3	1	17	10	4	7	7	11	8	

For these data construct a cumulative frequency distribution, a relative frequency distribution, a cumulative relative frequency distribution and a histogram.

(d) From a group of 8 children, 5 boys and 3 girls, three children are selected at random.
Calculate the probabilities that the selected group contains
(i) no girl, (ii) only one girl and (iii) one particular girl.

2. (a) Mathers et al. found that a sample of 591 admitted to a psychiatric hospital, 204 admitted to using cannabis at least once in their lifetime. We wish to construct a 95% confidence interval for the proportion of lifetime cannabis users in the sampled population of psychiatric hospital admissions.

(b) Two independent samples of sizes 8 soldiers and 6 sailors contained the following values :-

	Mean Height	sd
Soldiers	166.9cms	8.29
Sailors	170.3cms	8.5

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Based on this data can we conclude that soldiers are shorter than sailors by 5% LOS. Also find the 99% confidence interval for the test statistic used.

(e) A simple random sample of 10 people from a certain population has a mean age of 27. Can we conclude that the mean age of the population is not 30? The variance is known to be 20. Let $\alpha = 0.05$. 6

3. (a) The distribution function of a random variable X is given by 6

$$F_x(X) = 1 - (1 - X)e^{-X}, \; X \geq 0$$

Find the mean, variance and density function of X.

(b) Explain the following terms: 8

(i) Chi-Square Distribution and its properties.

(ii) Test of goodness of Fit

(iii) Correlation and Regression

(iv) Central Limit Theorem

(c) From the following table showing age of cars of a certain make and annual maintenance costs, obtain the lines of regression. Also find the approximate cost of maintaining a 3 years old car. 6

Age of cars : (years)	2	4	6	8	10	12
Annual Maintenance Cost (Rs.)	1600	1500	1800	1900	1700	2100	2000

4. (a) Can we conclude that chronically ill children tend, on the average to be less self-confident than healthy children? A test designed to measure self-confidence was administered to 16 chronically ill and 21 healthy children. The mean scores and standard deviations were as follows: 6

	Sample mean	Sample Variance
Illness Group	22.5	4.1
Well Group	26.9	3.2

$\alpha = 0.05$

(b) The following table gives for a sample of married women, the level of education and marriage adjustment score : 8

Marriage Adjustments			
Very Low	Low	High	Very High
24	97	62	58
22	28	30	41
32	10	11	20

Can you conclude that the higher the level of education the greater is the degree of adjustment in marriage?

(c) One batch of 12 animals are given test of inoculation. The other batch of 12 animals are not given test of inoculation. The number of dead and surviving animals are given in the following table. Can the inoculation be regarded as effective against the disease at 5% level of significance ? 6

	Dead	Surviving
Inoculated	2	10
Not inoculation	8	4

5. (a) Transverse Transverse diameter measurements on the hearts of adult males and females gave the 6 following results: 6

Group	Sample Size	Sample Mean(cm)	Sample Standard Deviation
Males	12	13.21	1.05
Females	8	11.0	1.01

Assuming normally distributed populations with equal variances. Construct the 90,95 and 99% confidence intervals for $\mu_1 - \mu_2$.

(b) There are three main brands of powder. A set of its 120 sales is examined and found to be allocated among four groups A, B, C, D and brand names I, II and III as shown in table: 8

	Groups			
Brand	A	B	C	D
I	0	4	8	15
II	5	8	13	6
III	18	19	11	13

Is there any significant difference in Brand preferences? Answer at 5% LOS using one way ANOVA Table.(Take 10 as the code value to subtract from all given values in your working)

Given $F(2,9)\ 0.05 = 4.26$.

(c) Analysis of the amniotic fluid from a simple random sample of 15 pregnant women yielded the following measurements on total protein (grams per 100 ml) present: 6

0.69, 1.04, 0.39, 0.37, 0.64, 0.73, 0.69, 1.04
0.83, 1.00, 0.19, 0.61, 0.42, 0.20, 0.79

Do these data provide sufficient evidence to indicate that the population variance is greater than 0.05? Let LOS be 95%. What assumptions are necessary?

6. (a) The table shows the yield per acre of four different plant crops grown on 10 lots treated with three different types of fertilizer. Test at .01 level of significance whether there is a significant difference in yield per acre due to crops.

	Crop1	Crop2	Crop3	Crop4
Fertilizer A	4.5	6.4	7.2	6.7
Fertilizer B	8.8	7.8	9.6	7
Fertilizer C	5.9	6.8	5.7	5.2

Use two way ANOVA to determine whether treatment effects are equal or not. (Given: $F_{0.01}(3,6) = 9.78$)

(b) The table shows the weight Z, heights X and ages Y of 12 boys. 10

(i) Find the linear least- squares regression equation of z on x and y.

(ii) Estimate the weight of a boy who is 9 years and 54 inches tall.

(iii) Find: r_{12} r_{13} r_{23}

Z	64	71	53	67	55	58	77	57	56	51	76	68
X	57	59	49	62	51	50	55	48	52	42	61	57
Y	8	10	6	11	8	7	10	9	10	6	12	9