



**RAJARATA UNIVERSITY OF SRI LANKA  
FACULTY OF APPLIED SCIENCES**

**B.Sc. General Degree in Applied Sciences  
Third Year - Semester I Examination-October / Nov. 2015**

**MAT 3214 – Applied Statistics**

**Answer all questions.**

**Time: 2 hours**

**Statistical Tables will be provided.**

01. (i) Clearly state the central limit theorem. (20)
- (ii) From past experience a professor knows that the test score of a student taking her final examination is a random variable with a mean of 75 and standard deviation of 8. How many students would have to take the examination to ensure, with probability at least 0.95 that the class average would be at least 73? (40)
- (iii) When a bus service reduces fares a particular trip, from New York City to Albany, New York, is very popular. A small bus can carry four passengers. The time between calls for tickets is exponentially distributed with a mean of 30 minutes. Assume that each call orders one ticket. What is the probability that the bus is filled in less than 3 hours from the time of the fare reduction? (40)
02. (i) The number of misprints on a page of a newspaper has a Poisson distribution with mean 1.2. Find the probability that the number of errors
- (a) on page four is 2.
  - (b) on page three is less than 3.
  - (c) number of errors on first 10 pages is 5.
  - (d) on all forty pages adds up to at least 3. (60)
- (ii) Two different types of polishing solution are being evaluated for possible use in a tumble-polishing operation for manufacturing intraocular lenses used in the human eye following cataract surgery. Three hundred lenses were tumble polished using the first polishing solution, and 253 had no polishing-induced defects. Another 300 lenses were tumble-polished using the second polishing solution, and 196 lenses were satisfactory upon completion. Is there any reason to believe that the two polishing solutions differ? Use  $\alpha = 0.01$ . (40)

03. (i) Two catalysts may be used in a chemical batch processing. Twelve batches were prepared using catalyst 1, resulting in an average yield of 86 and a sample standard deviation of 3. Fifteen batches were prepared using catalyst 2, resulting in an average yield of 89 with a standard deviation of 2. Assume that yield measurements are approximately normally distributed with the same standard deviation. Is there evidence to support a claim that catalyst 2 produces a higher mean yield than catalyst 1? Use  $\alpha = 0.01$ .

(40)

- (ii) Fifteen adult males between the ages of 35 and 50 participated in a study to evaluate the effect of exercise and diet on blood cholesterol levels. The total cholesterol was measured in each subject initially and then three months after participating in an aerobic exercise program and switching to a low-fat diet. The data are shown in the accompanying table. Do the data support the claim that aerobic exercise and low-fat diet are affect on mean reduction in blood cholesterol levels? Use  $\alpha = 0.05$ .

Subject	Blood Cholesterol Level	
	Before	After
1	265	229
2	240	231
3	258	227
4	295	240
5	251	238
6	245	241
7	287	234
8	314	256
9	260	247
10	279	239
11	283	246
12	240	218
13	238	219
14	225	226
15	247	233

(40)

- (iii) What is the difference between the two tests you used in part (i) and part (ii).

(20)

04. (i) Car hiring firm has large fleet of cars for hire by the day and it is found that the fleet suffers breakdowns at the rate of 21 per week. Assuming, breakdowns occur at a constant rate, random in time, and independently of one another, calculate the probability that in any one week more than 27 breakdowns occur. (40)

- (ii) The number of computer malfunctions per day is recorded for 260 days with the following results.

Number of malfunctions	Number of days
0	77
1	90
2	55
3	30
4	5
5	3

- (i) Suggest a suitable probability distribution for the number of computer malfunctions per day? (10)
- (ii) Test the goodness of fit of the above suggested model. Use  $\alpha = 0.05$ . (50)

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