Faculty of Mathematical and Physical Sciences
Ramaiah University of Applied Sciences

Department / Faculty	Mathematics and Statistics / FMPS	Programme	B. Tech.
Semester/Batch	5th / 2018		
Course Code	19CSC301A	Course Title	Probability and Statistics
Course Leader(s)	Dr Bhargavi Deshpande and Dr Subramanyam T		

Course Assessment

Reg.No.		Name of the Student	

Sections		Marking Scheme	Max Marks	Marks Scored	CO
Part -A	1.1	Describe the normal distribution	10		1
		Part-A Max Marks	**10**		
Part-B	2.1	Determine the probabilities	05		2
		Determine the expected value and standard deviation	05		3
	2.2	State the hypotheses	02		3
		Test statistic and calculations	05		4
		Interpretation and Conclusion	03		5
		Part-B Max Marks	**20**		
Part-C	3.1	State the model and fit the data	07		5
		Prediction and plot the graph	03		5
	3.2	Determine the probabilities	10		2
		Part-C Max Marks	**20**		
		Total Assignment Marks	**50**		

Assignment

Instructions to students:

1. The assignment consists of 3 parts
2. The assignment has to be neatly word processed as per the prescribed format
3. The maximum number of pages should be restricted to **35**
4. Use only SI units
5. **Submission Date: 16/01/2021**
6. **Submission after the due date is not permitted**
7. Method of evaluation as per the submission and marking scheme
8. At the end, you are required to comment on -
   a. Benefits you have derived by solving this assignment
   b. Whether assignment was able to assess *module learning outcomes* or not?
9. IMPORTANT: It is essential that all the sources used in preparation of the assignment must be suitably referenced in the text.

Preamble:

The module aims to teach elements of Probability Theory, Distributions and Regression that are useful in modelling and analysis of Computer Science and Engineering systems, especially data science, machine learning, simulation, computer networks and operating systems. Probability spaces, random variables, conditioning, distributions, expectations and Probability Laws are discussed. Stochastic Processes are introduced. Statistics, Statistical estimation and Hypothesis Testing are covered.

Part –A $\hspace{6cm}$ **(10 Marks)**

Preamble: Suppose X is a random variable which follows normal distribution with mean μ and standard deviation σ. The normal distribution curve is bell-shaped. It is widely used distribution since all most all the distributions converge to normal distribution for large n.

1.1 Write a note on Normal distribution and its characteristics. The following points need to be addressed in the report:
   - Probability density function
   - Cumulative distribution function
   - Skew ness
   - $1\sigma, 2\sigma$ and 3σ limits
   - Area properties

Part –B $\hspace{5cm}$ **(10+10=20 Marks)**

2.1 Suppose that a certain chemical concentration (mmol/L) has a normal distribution with mean 112 and standard deviation 8.
   a. What is the probability that chemical concentration equals 113? Is less than 105? Is at most 105?
   b. What is the probability that chemical concentration differs from mean by more than 1 standard deviation? Does this probability depend on the values of μ and σ?
   c. How would you characterize the most extreme 0.15% of chemical concentration values?

2.2 A sample of 15 radon detectors of a certain type was selected, and each was exposed to 100 pCi/L of radon. The resulting readings were as follows:

105.6   90.9   91.2   96.9   96.5   91.3   101.1   105.3
107.7   102.6   98.7   92.4   93.7   104.3   103.5

Does this data suggest that the population mean reading under these conditions differ from 100? State and test the appropriate hypotheses using 5% level of significance. State your conclusion.

Part –C   **(10+10=20 Marks)**

3.1   The following data relate the number of spare part of a car that were ordered as a function of the price of the spare part at six different locations.

Number ordered	90	115	121	138	155	182
Price	120	106	95	70	65	58

a.   Fit a linear regression model to the data and interpret the coefficients.
b.   How many units do you think would be ordered if the price were 60?
c.   Draw a scatter diagram and impose the fitted line of regression.

3.2   The number of surface flaws in metal sheet used in the interior of boilers has a Poisson distribution with a mean of 0.08 flaw per square foot of metal sheet. Assume a boiler contains 10 square feet of metal sheet.

a.   What is the probability that there are no surface flaws in a boiler?

b.   If 10 boilers are sold to a company, what is the probability that at least two of the 10 boilers has any surface flaws?

c.   If 12 boilers are sold to a company, what is the probability that at most one boiler has any surface flaws?

Guidelines for Submission
Citation of the *references* in the text is necessary in all the parts.
 • Restrict your report for **Part-A to 3 pages** only
 • Use of figures could be avoided in Part-A
 • Divide your discussions clearly as per the sections mentioned above.
 • Restrict your report for Part-B and C to a maximum of 12 and 20 pages respectively
 • Divide your discussions clearly as per the sections mentioned above and draw the conclusion at the end of each section.
 • *Please note: Marks will be awarded only to the sections and sub-sections clearly indicated as per the problem statement.*
 • *A presentation on the assignment should be given to the Examiner in MSRUAS format only.*

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