

**M.TECH IN PRINTING ENGG. AND GRAPHIC COMMUNICATION  
EXAMINATION, 2017  
(1st Yr, 1<sup>st</sup>. Sem.)  
DATA ANALYSIS AND STATICS**

Time: 3 Hrs.

Full Marks: 100

Answer any five of the following questions:

1. a) Briefly describe about activation function in artificial neural network.  
b) Explain difference between Supervised and unsupervised learning?  
c) Draw and Explain Multilayer feed forward network.  
d) What are the roles of k in kNN and k-means clustering?

[6+5+7+3=20]

2. a) Explain principal component analysis (PCA) with figure  
b) Discuss with example performance of k-nn classification when  
(i) k is very small (ii) k is large.  
c) What is the time complexity of merge sort ?

[10+7+3=20]

3. Suppose the National Transportation Safety Board (NTSB) wants to examine the safety of compact cars, midsize cars, and full-size cars. It collects a sample of three for each of the treatments (cars types). Using the hypothetical data provided below, test whether the mean pressure applied to the driver's head during a crash test is equal for each types of car. Use  $\alpha = 5\%$ .

Table ANOVA 1

	Compact Cars	Midsize cars	Full-size cars
	643	469	484
	655	427	456
	702	525	402
$\bar{X}$	<b>666.67</b>	<b>473.67</b>	<b>447.33</b>
S	<b>31.18</b>	<b>49.17</b>	<b>41.68</b>

- (i) State the null and alternative hypotheses

The null hypothesis for an ANOVA always assumes the population means are equal. Hence, we may write the null hypothesis as:

$H_0: \mu_1 = \mu_2 = \mu_3$  - The mean head pressure is statistically equal across the three types of cars. Since the null hypothesis assumes all the means are equal, we could reject the null hypothesis if only mean is not equal. Thus, the alternative hypothesis is:

$H_a$ : At least one mean pressure is not statistically equal

- (ii) Calculate the appropriate test statistic-The test statistic in ANOVA is the ratio of the *between* and *within* variation in the data. [20]

P.T.O

4. Short note on [5X4=20]
- i) Chi-square Distribution
  - ii) Central limit Theorem
  - iii) NP hard problem
  - iv) Tabu search method
5. a) Write down a divide-and-conquer algorithm for integer multiplication. What is the Complexity of binary search of algorithm?  
b) Discuss the Huffman coding algorithm.  
 $\{a,b,c,d,e,f\} = \{5, 9, 12, 13, 16, 45\}$  [7+3+10=20]
6. Write down back propagation algorithm. [20]
7. Show that in a multiclass classification task, the Bayes decision rule minimizes the error probability. Discuss on polynomial classifier with proper example. [12+8=20]
8. Write down pseudo code clustering based minimum spanning tree algorithm. What is NP completeness? What are the difference between P, NP and NP –Completeness? [10+4+6=20]