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**E Reg. No. :**

**Question Paper Code: 57P23**

Ph.D. COURSE WORK EXAMINATION, NOV 2017

Elective

Communication Systems

15PCM529 - PATTERN RECOGNITION

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 20 = 100 Marks)

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| 1. | (a) | Explain the concept of feature extraction in pattern recognition system with examples. | CO1- U | (20) |
|  |  | Or |  |  |
|  | (b) | What do you mean by pattern recognition? Explain. Describe design principles of pattern recognition system with an example. | CO1- U | (20) |
|  |  |  |  |  |
| 2. | (a) | Explain mathematically the Baye’s formula as expressed in English by the expression.  Posterior = (likelihood X prior) / evidence  Hence state the Bayes decision rule. | CO2- U | (20) |
|  |  | Or |  |  |
|  | (b) | Explain the uni-variate and multivariate normal density functions with examples. | CO2- U | (20) |
|  |  |  |  |  |
| 3. | (a) | Illustrate a Gaussian mixture distribution in one dimension and also illustrate a mixture of three Gaussian in 2 dimensional space. | CO3- Ana | (20) |
|  |  | Or |  |  |
|  | (b) | Let us assume that there are *m* samples in *n* dimensional space. Describe the mathematical components required to compute the *n* principal components for each sample. Describe how Principal Component Analysis (PCA) will enable dimensionality reduction. Put the above details in an algorithmic structure. | CO3- Ana | (20) |
|  |  |  |  |  |
| 4. | (a) | Explain Principal Component Analysis (PCA) with analytical treatment. | CO4- U | (20) |
|  |  | Or |  |  |
|  | (b) | Starting from fundamentals derive an expression for density estimation  . | CO4- U | (20) |
|  |  |  |  |  |
| 5. | (a) | Write a short note on application of normal mixture. | CO5- U | (20) |
|  |  | Or |  |  |
|  | (b) | Illustrate with dendrogram the hierarchical agglomerative clustering and the hierarchical division clustering. Bring out the differences in the computational procedures involved in both of them. | CO5- U | (20) |
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