

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH
BRANCH: ECE

SEMESTER : VII
SESSION : MO/2022

SUBJECT: EC407 MULTI-CHANNEL SIGNAL PROCESSING

TIME: 3:00 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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| Q.1(a) | Highlight the underlying concept of Principal Component analysis. | [2] | CO1,PO1,BL2 |
| Q.1(b) | How Principal Component Analysis is applicable to problems related to multi-channel signal processing. | [3] | CO1,PO2,BL4 |
| Q.1(c) | Why whitening is incorporated as an important pre-processing step in multi-channel signal processing? Briefly explain the computation of Whitening matrix for estimation of co-variance matrix of n samples. | [5] | CO3,PO3,BL4 |
| Q.2(a) | What is Blind source separation problem? | [2] | CO2,PO1,BL1 |
| Q.2(b) | How can we separate signals from a mixture of n signals? | [3] | CO3,PO2,BL3 |
| Q.2(c) | Discuss Natural gradient method for BSS. | [5] | CO1,PO1,BL2 |
| Q.3(a) | What is the major difference between Principal component analysis and Independent component analysis? | [2] | CO1,PO1,BL2 |
| Q.3(b) | How can we use INFOMAX principle for optimization problems? | [3] | CO4,PO3,BL3 |
| Q.3(c) | Define Kolmogoroff complexity. Discuss its role in Independent component analysis. | [5] | CO2,PO3,BL4 |
| Q.4(a) | Summarize two features of sparse representation that distinguish it from other statistical representations. | [2] | CO2,PO1,BL1 |
| Q.4(b) | Discuss the idea behind sparse signal processing. | [3] | CO1,PO1,BL2 |
| Q.4(c) | Explain the algorithm for Empirical mode decomposition. | [5] | CO4,PO2,BL2 |
| Q.5(a) | What is the use of spatial filters? | [2] | CO4,PO2,BL1 |
| Q.5(b) | What are the applications of common spatial pattern? | [3] | CO4,PO1,BL1 |
| Q.5(c) | Discuss application of blind source separation for a real life problem. | [5] | CO5,PO4,BL5 |

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