

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

**CLASS: BE  
BRANCH: ECE**

**SEMESTER : VII  
SESSION : MO/19**

**SUBJECT: MEC2163 SPEECH PROCESSING & RECOGNITION**

**TIME:3:00 HOURS**

**FULL MARKS: 60**

**INSTRUCTIONS:**

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
  2. Candidates may attempt any 5 questions maximum of 60 marks.
  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) Discuss the quasi-periodic nature of the speech signal. [2]  
Q.1(b) Explain the human speech production process? [4]  
Q.1(c) Write the basic steps involved in the acoustic phonetic approach of the speech recognition. Explain it using the diagram. Also mention atleast 2 issues related to it. [6]
- Q.2(a) Differentiate between ideal and realistic filter banks. [2]  
Q.2(b) Explain the non-uniform filter-bank structure and its realization using tree structure? [4]  
Q.2(c) What is FFT implementation of the uniform filter bank? Explain how short time Fourier transform is used in it? [6]
- Q.3(a) Explain the log spectral distortion measure used for pattern comparison. [2]  
Q.3(b) Briefly discuss the time alignment and normalization procedure in pattern comparison. [4]  
Q.3(c) What is the Cepstral distance for feature vector comparison? Also describe the usefulness of cepstral distance? [6]
- Q.4(a) What is template training? Write the name of template training methods? [2]  
Q.4(b) Briefly discuss the different speaker adaptation scenarios with block diagram. [4]  
Q.4(c) What are the basic steps involved in the modified K-mean algorithm? [6]
- Q.5(a) Explain the discrete Markov model using Markov chain. [2]  
Q.5(b) Given a single fair coin, i.e.,  $P(\text{Heads}) = P(\text{Tails}) = 0.5$ , which you toss once and observe tails  
1.What is the probability that the next 10 tosses will provide the sequence (HHTHTTHTTH)?  
2. What is the probability that the next 10 tosses will provide the sequence (HHHHHHHHH)?  
3. What is the probability that 5 of the next 10 tosses will be tails? What is the expected number of tails over the next 10 tosses? [4]  
Q.5(c) Discuss the solution of first problem (probability evaluation) associated with hidden Markov model using forward procedure. [6]
- Q.6(a) What are the basic issues related to the connected word recognition problem? [2]  
Q.6(b) Explain the connected word recognition problem using the mathematical statement. [4]  
Q.6(c) Discuss the procedure of two level dynamic programming algorithm for solving the connected word recognition problem. [6]
- Q.7(a) What are the characteristics of the speech recognition applications suitable for speech recognition deployment? [2]  
Q.7(b) Write a short note on voice repertory dialer application of speech recognition system. [4]  
Q.7(c) What are the methods of handling recognition errors? Discuss in detail. [6]