

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER IV (NEW) – EXAMINATION – SUMMER - 2017

Subject Code: 2744101

Date: 03/05/2017

Subject Name: Advance Topics in Signal and Image Processing

Time: 02:30PM-05:00PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

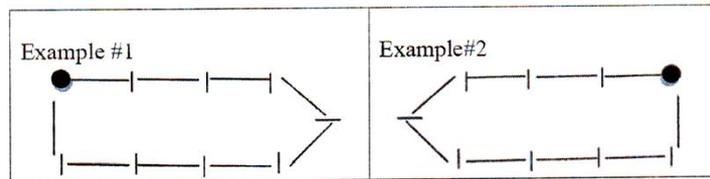
Q.1 (a) Obtain the direct form-I and direct form-II realization for 07
$$y(n) = \frac{3}{4} y(n-1) - \frac{1}{8} y(n-2) + x(n) + \frac{1}{3} x(n-1)$$

Give your comments.

(b) Discuss lattice structures with suitable examples. 07

Q.2 (a) Explain Fourier descriptor with necessary mathematics and sketches. 07

(b) Determine Chain Codes, First Difference and Shape Number for the following shapes: (Use anti clockwise direction) 07



OR

(b) Write a short note on histogram based (statistical) features. 07

Q.3 (a) Prove that type-II FIR filter is having linear phase. Which kind of filter/s can't be designed using type-II FIR filter? 07

(b) Explain windowing technique for FIR filter designing. How the Kaiser window method differs from others? 07

OR

Q.3 (a) Discuss the impulse invariance transformation with its demerits. 07

(b) Compare FIR and IIR digital filter. How the choice of FIR or IIR filter is made? 07

Q.4 (a) Write a short note on Bayesian classifier. 07

(b) An image retrieval system produced the following 10 ranked results for a search operation against a database of 500 images, of which 5 are relevant to query: 07

Rank	1	2	3	4	5	6	7	8	9	10
Result	R	R	N	R	N	N	N	R	N	R

Where R means relevant and N means not relevant. Compute Precision and Recall for each point. Also plot the ROC.

OR

Q.4 (a) Explain the of K-NN classifier with suitable example. 07

(b) Describe various performance parameters used for classifiers with their importance. If required, explain with suitable example. 07

Q.5 (a) State and prove noble identities for multi-rate signal processing. 07

(b) Explain the decimation process with suitable derivations and sketches. 07

OR

Q.5 (a) Instead of single stage, why decimation is performed in multi stage? Explain with suitable example. 07

(b) What is frequency warping in bilinear transformation? How it is avoided? For the following analog filter, using bilinear transformation obtain H(z). 07

$$H_c(s) = \frac{1}{(s+1)^2}, \quad T = 0.1 \text{ s}$$
