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**

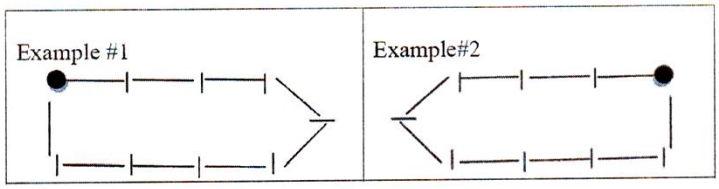
$$y(n) = \frac{3}{4}\,y(n-1) - \frac{1}{8}\,y(n-2) + x(n) + \frac{1}{3}\,x(n-1)$$

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**

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

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