Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

FIFTH SEMESTER BTECH. (MT) DEGREE END SEMESTER EXAMINATION

MARCH 2021

SUBJECT: VIDEO CODEC AND STANDARDS (ECE - 4092)

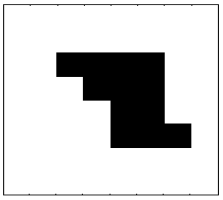
TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. i. Explain Transform coding with neat block diagram.

ii. Segment the given shape using split and merge technique.



1B. i. Explain the energy compaction in discrete cosine transform.

ii. Arrange the following 2D DCT coefficient in the zig-zag order

-145	-30	-61	27	56	-20	-2	0
4	-22	-61	10	13	-7	-9	5
-47	7	77	-25	-29	10	5	-6
-49	12	34	-15	-10	6	2	2
12	-7	-13	-4	-2	2	-3	3
-8	3	2	-6	-2	1	4	2
-1	0	0	-2	-1	-3	4	-1
0	0	-1	-4	-1	0	1	2

(5+5)

2A Perform the motion estimation and compensation between the current and the reference frame as shown in the below table. (Current block is highlighted as Red colour).

Current Frame						
7	0	5	1	6	5	6
2	6	7	6	0	1	2
0	2	5	0	3	5	6
7	8	7	2	3	0	1
6	7	8	0	5	5	6
4	2	0	4	5	3	4
5	4	6	1	2	3	4

Reference Frame						
7	0	5	1	6	5	6
2	6	7	6	0	1	2
0	2	2	1	4	5	6
7	8	4	4	3	0	1
6	7	0	0	5	5	6
4	2	0	4	5	3	4
5	4	6	1	2	3	4

2B. Explain first and second order derivative with a neat example and explain its significance in thick and thin edge detection

(5+5)

3A. Explain H.264 Encoder and Decoder with neat block diagram.

3B. Find the Fourier transform, H(u,v) of this mask in the frequency domain.

$$h = \begin{bmatrix} 0 & 0 & -1 & 0 & 0 \\ 0 & -1 & -2 & -1 & 0 \\ -1 & -2 & 16 & -2 & -1 \\ 0 & -1 & -2 & -1 & 0 \\ 0 & 0 & -1 & 0 & 0 \end{bmatrix}$$

What type of filter is this, LPF, BPF or HPF? Justify your answer.

(5+5)

4A. Define 4-8 and m- adjacency. Compute the lengths of the shortest 4- 8- and m- path between p and q in the image segment as shown below by considering V= {2,3,4,5}. Point p and point q.

2	2	4	6	5	0	3	4(q)
1	0	5	6	2	3	4	2
3	0	5	1	2	3	5	6
7	0	6	5	4	3	0	0
7	6	1	2	4	5	6	0
0	6	5	7	3	4	5	1
1	0	0	3	4	5	6	5
4(p)	3	2	1	3	4	5	5

(5+5)

4B. Assuming continuous intensity values suppose that an image has the intensity PDF $p(r) = \frac{2r}{(L-1)^2}$ for r between 0 to L-1 and $p(r) = 0$ for other values for r. Find the transformation function that will produce an image whose intensity PDF is $p(z) = \frac{3z^2}{(L-1)^3}$ for all z and $p(z)$ =0 for other values of z.

(5+5)

5A. Encode the message DEPARTMENT using Arithmetic coding for the given probability distribution.

Symbol	D	E	P	A	R	T	M	N
Probability	.1	.2	.1	.1	.1	.2	.1	.1

5B. Calculate the 4-point 2D DCT for the following sub-image at the specified location.

63	45	39	55
57	61	34	52
60	65	57	45
49	38	29	45

(5+5)