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

CLASS: BE **SEMESTER : VII**
BRANCH: ECE **SESSION : MO/18**

SUBJECT: CS7107 DIGITAL IMAGE PROCESSING

TIME: 3 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.

Q.1(a) Explain the photophic vision and scotopic vision. [2]

Q.1(b) Given a gray scale image on paper whose physical dimension is 2.5 inch X 2.5 inch scanned at a rate of 150 dpi. Calculate haw many bits are required to represent the image? How much time is required to transmit the image if the modem is 28kbps? [4]

Q.1(c) For the following image consider V = {0,1} and compute the lengths of the shortest 4-,8- and m-path between p and q pixels. [6]

	3	1	2	1 (q)
	2	2	0	2
	1	2	1	1
(p)	1	0	1	2

Q.2(a) Write the Hadamard Transform kernel. [2]

Q.2(b) Differentiate convolution and correlation. [4]

Q.2(c) Prove $f(x,y)(-1)^{x+y} \boxed{\leftrightarrow} F(u-M/2, v-N/2)$, where the terms have usual meaning. [6]

Q.3(a) Differentiate image enhancement and image restoration. [2]

Q.3(b) Perform the histogram equalization for the 8X8, eight-level image given below:- [4]
Pixel distribution of the image.

r_k	0	1	2	3	4	5	6	7
p_k	8	10	10	2	12	16	4	2

Q.3(c) Find the first derivative and second derivative for the following image strip. Also write the application of both in image processing. [6]

6	6	6	6	5	4	3	2	1	1	1	1	1	1	6	6	6	6	6

Q.4(a) Draw and explain a model of the image Degradation/Restoration process. [2]

Q.4(b) Explain the inverse filtering for restoration. Also write the limitation. [4]

Q.4(c) Derive the mathematical model for the uniform linear motion blurred image. [6]

Q.5(a) Define the term Entropy. [2]

Q.5(b) Explain the separability property of Fourier transform. [4]

Q.5(c) Explain the Minimum Mean Square Error filtering for restoration. [6]

Q.6(a) Explain the arithmetic coding. [2]

Q.6(b) Explain the bit plane coding with suitable example. [4]

Q.6(c) Consider the simple 4X8, 8-bit image. [6]

21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243
21	21	21	95	169	243	243	243

Compute the entropy of the image.

Q.7(a) Define Inter Pixel redundancy and Psychovisual redundancy. [2]

Q.7(b) Define order static filter with example. [4]

Q.7(c) For the following image ,Assuming that gray level is 0-7, that is 8, apply the following transformations on the image . 1. negative image transform . 2. logarithm function where a=0.5 may be assumed, [6]

1	2	3
5	5	6
6	7	6