

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION MO/2024)

CLASS: BTECH  
BRANCH: ECE

SEMESTER : VII  
SESSION : MO/2024

SUBJECT: EC431 DIGITAL IMAGE AND VIDEO PROCESSING

TIME: 02 Hours

FULL MARKS: 25

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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- Q.1(a) Define  $2 \times 2$  and  $3 \times 3$  matrices for image translation and rotation. Comment if there is no such possible transformation. [3] CO1 BL IV
- Q.1(b) Explain 8-adjacency and m-adjacency with a suitable example. [2] CO1 I

- Q.2(a) Perform histogram equalization of the 3 bit/pixel image having the following histogram. [2] CO1 II

Gray Level	0	1	2	3	4	5	6	7
No. of pixels	0	0	0	12	14	18	20	10

- Q.2(b) Derive the transformation function for histogram equalization. Does the result in 2(a) achieve the target histogram? Justify your answer. [3] CO1 IV
- Q.3(a) For the below sub-image of 8 bit/pixel, generate the most significant three-bit planes and combine them to generate another sub-image of 8 bit/pixel. [3] CO1 III

127	135	200	205
124	130	210	209
123	0	205	205
135	140	210	208

- Q.3(b) For the sub-image in 3(a), perform image negative operation followed by thresholding with an intensity value of 128. [2] CO1 III
- Q.4(a) Describe the ringing and blurring artifacts with respect to an ideal low pass filter. How are those artifacts related to the cut-off frequency of the filter? [2] CO2 II
- Q.4(b) Write a short note on homomorphic filtering and mention one application. [3] CO2 I
- Q.5(a) Among Gradient and Laplacian operator, which one will you use for the following? Discuss with reason. [3] CO2 V
- (i) Edge localization
  - (ii) Edge strength computation
  - (iii) Edge direction determination
- Q.5(b) Consider an image  $f(x,y) = 128 \forall x,y$ . Draw the frequency spectrum of the image. [2] CO2 IV