Reg. No.															

B.Tech. DEGREE EXAMINATION, NOVEMBER 2023

Sixth Semester

18BMC306J – MEDICAL IMAGE PROCESSING

(For the candidates admitted from the academic year 2020-2021 to 2021-2022)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours Max. Marks: 100

	Marks	BL	CO	PO

PART – A (20 × 1 = 20 Marks)

Answer **ALL** Questions

1. Match the number of grey levels present in 8 bit image. — 1 | 1 | 1 | 1
   (A) 128 (B) 256
   (C) 512 (D) 1024

2. Find the number of bit required to store image of size 128×128 with 64 gray levels — 1 | 1 | 1 | 2
   (A) 4096 (B) 8192
   (C) 12288 (D) 98304

3. Choose the range of intensity levels to which the human eye can adapt — 1 | 3 | 1 | 1
   (A) 10^{-6} to 10^{-4} (B) 10^{4} to 10^{6}
   (C) 10^{-6} to 10^{4} (D) 10^{-5} to 10^{5}

4. Interpret the output of single imaging sensor — 1 | 3 | 1 | 1
   (A) Unidirectional waveform (B) Alternating waveform
   (C) Voltage waveform (D) Square waveform

5. Identify the general form of representation of log transform — 1 | 1 | 2 | 1
   (A) $S = C\log 10(1+r)$ (B) $S = C\log 10(1/r)$
   (C) $S = C\log 10(1*r)$ (D) $S = C\log 10(1-r)$

6. Relate which of the following represent smallest discernible change in intensity level — 1 | 3 | 2 | 1
   (A) Contour (B) Intensity resolution
   (C) Saturation (D) Contrast

7. Identify the equation used for obtaining R value in terms of HIS components? — 1 | 1 | 2 | 1
   (A) $R = 1[1-(S\cos H)/\cos(60°-H)]$ (B) $R = 1[1+(S\cos H)/\cos(120°-H)]$
   (C) $R = 1[1+(S\cos H)/\cos(60°-H)]$ (D) $R = 1[1+(S\cos H)/\cos(30°-H)]$

8. Assess the process of subtracting the blurred image from the original image is called — 1 | 3 | 2 | 1
   (A) Unsharp masking (B) High pass filtering
   (C) Low pass filtering (D) High boost filtering

9. Predict the type of technique that uses filters to reduce artifacts 1 3 3 1

(A) Fourier reconstruction (B) Filter back projection
(C) Back projection (D) Polar coordinate

10. Recall the example of clustering method 1 1 4 1

(A) Level set method (B) Graph partitioning method
(C) Watershed transformation (D) Neural network segmentation

11. Compare the advantage of iterative reconstruction technique versus filter back projection 1 4 3 1

(A) Better depiction of bone detail (B) Does not require specification of reconstruction kernel
(C) Slower reconstruction (D) Faster reconstruction

12. Choose the type of transform used as line integral along the path of rays. 1 3 3 3

(A) Radon (B) DCT
(C) DFT (D) DST

13. Select the type of reconstruction method used by modern CT scanner 1 3 3 3

(A) Back projection (B) Iterative method
(C) Fourier transform (D) Filter back projection

14. Match the type of operator used to extract the most appropriate location of an edge, when there is gradual change in intensity level 1 1 4 1

(A) Sobel operator (B) Laplacian operator
(C) Prewitt operator (D) Gradient operator

15. Select the type of thresholding method, if there are two types of light object on a dark background 1 1 4 1

(A) Local thresholding (B) Global thresholding
(C) Adaptive thresholding (D) Multiple thresholding

16. Determine the type of second order operator most robust to noise in edge filtering 1 3 4 3

(A) Sobel operator (B) Laplacian operator
(C) Prewitt operator (D) Laplacian of Gaussian operator

17. Choose the one on which coding redundancy works well 1 3 5 1

(A) Pixels (B) Intensity
(C) Matrix (D) Coordinates

18. Recall information per source is called 1 1 5 1

(A) Sampling (B) Quantization
(C) Entropy (D) Normalization

19. Identify the formula used in the redundancy of the data 1 2 5 1

(A) $1-\left(\frac{1}{C}\right)$ (B) $1+\left(\frac{1}{C}\right)$
(C) $1-\left(-\frac{1}{C}\right)$ (D) $1/C$

20.	Match the formula $P_v=n/MN$ the (A) Coding redundancy (B) Spatial redundancy (C) Temporal redundancy (D) Irrelevant info	1	1	5	1

PART – B (5 × 4 = 20 Marks)
Answer **ANY FIVE** Questions

		Marks	BL	CO	PO
21.	Define Weber's ratio. Demonstrate with example.	4	1	1	1
22.	Demonstrate optical illusion and simultaneous contrast with example.	4	3	1	1
23.	Compute contrast stretching and intensity level slicing for a 3 bit image of size 3×3 where u=[7 5 2; 3 4 2; 6 2 1] with a=2 and b=5?	4	3	2	2
24.	Give an example of various frequencies domain filters used in image enhancement.	4	2	2	1
25.	Define radon transform and explain with example.	4	1	3	1
26.	Explain optimum global thresholding using Otsu method.	4	2	4	1
27.	Describe wavelet transform based image fusion.	4	2	5	1

PART – C (5 × 12 = 60 Marks)
Answer **ALL** Questions

		Marks	BL	CO	PO
28. a.	Illustrate in detail fundament steps in digital image processing with neat diagram.	12	3	1	1
	(OR)				
b.	Compute Haar transform for N=8.	12	3	1	2
29. a.	Estimate the histogram equalization for an image of size M×N (64×64) with gray level L=8.	12	2	2	2

r_k	0	1	2	3	4	5	6	7
n_k	790	1023	850	656	329	245	122	81

(OR)

b.	Explain in detail about the following		2	2	1
	(i) Conversion of RGB to HSI model	6			
	(ii) Conversion of HIS to RGB model	6			
30. a.	Discuss the following in detail.		2	3	1
	(i) Inverse fillering	6			
	(ii) Minimum mean square fillering	6			

(OR)

b.	Describe in detail about fourier reconstruction of MRI image projection geomentry mode.	12	2	3	1

31. a.	Explain in detail about the following		2	4	1
	(i) Marr-Hildreth edge detector	6			
	(ii) Canny edge detector	6			
	(OR)				
b.	Demonstrate in detail about segmentation using morphological watersheds dam construction algorithm.	12	3	4	1
32. a.	Determine the Huffman coding for the word WELCOME.	12	3	5	1
	(OR)				
b.	Explain various types of image registration algorithm with neat diagram.	12	2	5	1

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