b. Give a brief account on the following: 2 4 1
(i) Canny edge detector 8
(ii) Region splitting and merging algorithm 4

32. a. Perform Huffman coding for the sauce symbols a_1, a_2, a_3, a_4, a_5, a_6 and a_7 with probabilities 0.05, 0.1, 0.6, 0.01, 0.04, 0.15, 0.05. Calculate the average length, entropy and efficiency. 12 2 5 1

(OR)

b. Discuss in detail about the pixel based image fusion techniques. 12 2 6 1

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Reg. No.															

B.Tech. DEGREE EXAMINATION, MAY 2023
Sixth Semester

18BMC306J – MEDICAL IMAGE PROCESSING
(For the candidates admitted from the academic year 2018-2019 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

PART – A (20 × 1 = 20 Marks)
Answer **ALL** Questions

Marks BL CO PO

1. The 2D-DFT for N=2 is 1 1 1 1
   (A) $\frac{1}{\sqrt{2}}\begin{bmatrix}1 & 1\\ 1 & -1\end{bmatrix}$ (B) $\frac{1}{2}\begin{bmatrix}1 & 1\\ 1 & -1\end{bmatrix}$
   (C) $\frac{1}{\sqrt{2}}\begin{bmatrix}-1 & -1\\ -1 & 1\end{bmatrix}$ (D) $\frac{1}{2}\begin{bmatrix}1 & -1\\ 1 & -1\end{bmatrix}$

2. Identify the transform which has excellent energy compaction property for highly correlated data 1 1 1 1
   (A) DCT (B) DFT
   (C) DST (D) HAAR

3. If the number of gray level in the image is 1024, the number of bits used to represent each pixel is 1 1 1 1
   (A) 8 (B) 9
   (C) 10 (D) 1

4. Consider a person standing at a distance of 100m looking at a tree whose height is 15m. the focal length of the lens of a person is 17mm. calculate the image formed in the retina of the eye of the person. 1 1 1 1
   (A) 2.5 mm (B) 2.55 mm
   (C) 2.75 mm (D) 3.5 mm

5. The power law transformation is given by 1 1 2 1
   (A) $S = rC^{\gamma}$ (B) $S = \gamma C^{r}$
   (C) $S = Cr$ (D) $S = Cr^{\gamma}$

6. Select the non linear filter from the following 1 1 2 1
   (A) High pass filter (B) Median filter
   (C) Gaussian filter (D) Laplacian filter

7. Which one of the following model is the used in color printers? 1 1 2 1
   (A) RGB (B) CMY
   (C) HIS (D) YIQ

8. Point out the second order derivative filter from the following 1 1 2 1
   (A) Low pass filter (B) Median filter
   (C) Laplacian filter (D) Gaussian filter

9. The image degradation model is given by 1 1 3 1
   (A) F=HG (B) $F=H^{-1}G$
   (C) $F=G^{-1}H$ (D) G=FH

10. In fourier reconstruction of MRI _____ 1 1 3 1
   (A) 1D filter is mapped in 2D fourier space (B) 2D filter is mapped in 1D fourier space
   (C) 2D filter is mapped in 3D fourier space (D) 1D filter is mapped in 3D fourier space

11. _____transform is used as line integral along the path of rays. 1 1 3 1
   (A) Radon (B) DCT
   (C) DFT (D) DST

12. In convolution back projection method, _____transform is used 1 1 3 1
   (A) DCT (B) DFT
   (C) DST (D) Hilbert

13. _____algorithm segments the regions in to catchment basins 1 1 4 2
   (A) Watershed (B) Region growing
   (C) Snake (D) K-means clustering

14. When the threshold T depends on the spatial coordinates, then variable thresholding is referred as _____thresholding. 1 1 4 2
   (A) Global (B) Multiple
   (C) Local (D) Dynamic

15. If there are two types of light object on a dark background then it comes under _____ 1 1 4 2
   (A) Local thresholding (B) Global thresholding
   (C) Adaptive thresholding (D) Multiple thresholding

16. The non maxima suppression exist in edge detection algorithm is 1 1 4 2
   (A) Canny (B) Sobel
   (C) Prewiti (D) Marr-Hildreth

17. Which one of the following compression comes under lossy compression technique? 1 1 5 4
   (A) Huffmann (B) Arithmetic
   (C) Bit-plane (D) Transform

18. The one to one correspondence between the source symbols and code words does not exist in 1 1 5 4
   (A) Arithmetic coding (B) Huffmann coding
   (C) Bit-plane coding (D) Run-length coding

19. The most popular technique used for removing coding redundancy is 1 1 5 4
   (A) Arithmetic (B) Huffman
   (C) Bit-plane (D) Run length

20. The images are registered purely via a rotation and two orthogonal translations. 1 1 6 1
   (A) 2D to 2D (B) 2D to 3D
   (C) 3D to 3D (D) 3D to 2D

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

21. Design a Hadamard transform for N=4. 4 3 1 1

22. Define 8-adjacency and m-adjacency of the pixel with an example. 4 1 1 1

23. Write a short note on intensity slicing techniques. 4 1 2 1

24. Convert the image in RGB to HSI model. 4 2 2 1

25. Mention the properties of image degradation model. 4 1 3 1

26. Write the algorithm for global thresholding. 4 1 4 2

27. Give a brief account on run length coding techniques. 4 1 5 1

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

28. a. Describe the elements of visual perception with a neat diagram. 12 3 1 1

(OR)

   b. Design a Haar transform for N=8. 12 3 1 1

29. a. Illustrate some of the second order derivative filters with an example. 12 2 2 1

(OR)

   b. Enumerate in detail about the pseudo color image processing technique. 12 2 2 1

30. a. Derive the necessary expressions for minimum mean square error filter. 12 3 3 3

(OR)

   b. Elaborate in detail about the digital implementation of filter back projection algorithm. 12 2 3 3

31. a. Discuss in detail about the segmentation using morphological watershed algorithm including the dam construction process. 12 2 4 1

(OR)