MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1. The output of 3 × 3 mid-point filter at the underlined pixel of the image f(x,y) = [1 2 3; 7 1 1; 2 1 3], is:
A. 5/3 B. 7/4 C. 4 D. 2/7

For the image f (x,y) = [1 2 3; 7 1 7; 2 1 3], Calculate the output of the following 3 × 3 operation applied at the center (underlined) pixel:

2. The arithmetic mean filter = ...
A. 5.44 B. 4.44 C. 3 D. 3.44

3. The harmonic mean filter = ...
A. 12 B. 1.817 C. 8 D. 5

4. The minimum filter = ...
A. 0 B. 2 C. 1 D. 3

5. The median filter = ...
A. 3/4 B. 7/2 C. 4/3 D. 2

6. If the color at a pixel is (R= 0.2, G= 0.4, B= 0.6) is converted to CMY color, the value of C is:
A. 0.8 B. 0.6 C. 0.4 D. 0.7

7. If the color at a pixel is (R= 0.2, G= 0.4, B= 0.6) is converted to CMY color, the value of Y is:
A. 0.8 B. 0.6 C. 0.4 D. 0.2

8. If the color at a pixel is (R= 0.2, G= 0.4, B= 0.6) is converted to HSI color, the value of S is:
A. 0.5 B. 0.7 C. 0.1 D. 0.2

9. If the color at a pixel is (R= 0.2, G= 0.4, B= 0.6) is converted to HSI color, the value of H is:
A. 150° B. 210° C. 90° D. 280°

10. Which of the following transforms maps a wide range of high gray-levels in the input image into a narrower range of gray-levels in the output image?
A. Log. B. Negative. C. Power-law transform. D. Fourier transform.

11. Which of the masks (center in the middle) below approximates $\frac{\partial^2 A}{\partial x^2}$,i.e. (f(x,y-1) + f(x,y+1) – 2*f(x,y)),
A. [1, -2 ,1] B. [1; -1 ;1] C. [-2, 1 ,1] D. [1, 1,-2]

12. Which of the following transforms maps a narrow range of low gray-levels in the input image into a wider range of gray-levels in the output image?
A. Log. B. Negative. C. Power-law. D. Fourier transform.

13. The contra-harmonic mean filter, with positive Q, eliminates:
A. periodic noise B. salt noise C. impulse noise D. pepper noise

14. The mask of size M×N (3 × 3) is defined as H(U-M/2, V-N/2) = [1 1 1; 1 0 1; 1 1 1], represents
A. HPF B. LPF C. BPF D. no filter

15. Edges consist of primarily ..... spatial frequency information.
A. zero B. low C. high D. medium

16. An image f(x, y) is processed to by applying the following operation at each pixel, g(x, y) = f(x, y) + 0.2 f(x-1, y) + 0.2 f(x+1, y) + 0.2 f(x, y-1) + 0.2 f(x, y+1), where g(x, y) is the new pixel value. This processing can be performed using which one of the following 3 × 3 masks:
A. (0, 0.2, 0; 0.2, 1, 0.2; 0, 0.2, 0)
B. (0, -2, 0; 0.2, 1, 0.2; 0, -2, 0)
C. (0, 0.2, -1; 0.2, 1, 0.2; 0, 0.2, -1)
D. (1, 0.2, 0; 0.2, 1, 0.2; 1, 0.2, 0)

17. Which of the following is best suited for salt-and-pepper noise elimination?
A. Average filter B. Box filter C. Max filter D. Median filter

18. Edge detection is commonly accomplished by performing a spatial -------- of the image field.
A. differentiation B. integration C. smoothing. D. retrieval.

19. Which of the following filters is a high-pass filter HPF?
A. PSF B. Arithmetic mean C. Median. D. Geometric mean.. Laplacian

20. The contra-harmonic mean filter, with Q = 0, is equivalent to
A. Median B. geometric mean arithmetic mean D. harmonic mean E. laplacian

21. .....is a process that expands the range of intensity levels in an image, so that it spans the full intensity range of the recording medium or display device.
A. Bit-plane slicing Contrast stretching C. Brightness adaptation D. Gray-level slicing

22. An image f(x,y) is processed as follows to produce an image g(x,y): f(x,y) is blurred to produce smoothed(f(x,y)), then $g_{mask}(x,y) = f(x,y) - \text{smoothed}(f(x,y))$, $g(x,y) = f(x,y) + k.\ gmask(x,y)$. with k = 1 , this process is called.....
A. unshap-masking B. high-boost filtering C. bit-plane slicing D. image restoraion

23. The Fourier transform of the Laplacian is
A. $-4\pi^2(u^2+v^2)^2$. $-4\pi^2(u^2+v^2)$. C. $-4\pi^2(u^2+v^2)^4$ D. $4\pi^3(u^2-v^2)$.

24. The negative of an image, is calculated by
A. s = L + 1 + r s = (L - 1) – r C. s = L + 1 - r D. s = (L - 1) + r

25. In true-color images the color is represented in how many bits?
A. 24 B. 8 C. 64 D. 16

Given the 4 × 4, 3-bit image shown perform histogram equalization on the image and answer the following questions about the output (equalized) image:

x\y	0	1	2	3
0	0	1	5	2
1	2	3	0	1
2	2	7	4	3
3	6	0	3	1

26. The intensity at (0,1) is
A. 7 3 C. 5 D. 6

27. The intensity at (2,1) is
7 B. 3 C. 5 D. 4

28. The intensity at (0, 2) is
A. 7 B. 0 6 D. 1

29. If we perform bit-plane slicing on the 3 × 3 image [5,2,6;7,3,2;4,5,1], the middle (2^1) bit plane is:
[0,1,1;1,1,1;0,0,0] B. [0,1,0;0,0,0;1,0,1] C. [1,1,0;1,1,1;1,0,1] D. [0,1,0;0,1,1;1,1,1]

30. If the Fourier transform of the image f (x,y) = [1 1 1 1] is F(u,v), then F(0,0) = ...
4 B. -2+j C. 8 D. 16

31. If the Fourier transform of the image f (x,y) = [1 1 1 1] is F(u,v), then F(0,2) = ...
A. 4 B. -2-j C. 8 0

32. A high contrast image has …….. dynamic range.
A. no B. small C. zero large