Total No. of Questions – [06] Total No. of Printed Pages: 03

solution

MAY

**~~DECEMBER~~ 2021 - ENDSEM EXAM**

**B. TECH. (E & TC) (SEMESTER - I)**

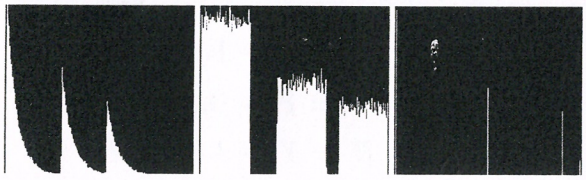
**COURSE NAME: Image and Video Processing**

**COURSE CODE: ETUA40181A**

**(PATTERN 2018)**

Time: [1Hr] [Max. Marks: 30]

| Question No. | Question Description | Marks |
|---|---|---|
| Q.1 a | What are SIFT features? Describe Scale space with reference to SIFT features.<br>SIFT features 2 M (any 2) Procedure- 2M | 4 |
| Q.1 b | In Harris corner detection, if the equation for change in intensity is given by the equation of E(u,v) where M is covariance matrix, apply cornerness measure R to the given M matrix and decide whether the given point is a corner or edge? Justify the answer. Given K=0. 8<br>$E(u,v)=(u \quad v)M\begin{pmatrix}u\\v\end{pmatrix}$ $M=\begin{bmatrix}1.27 & 0\\0 & 1.26\end{bmatrix}$<br>Solution: Measure of cornerness is given by R $M=\begin{bmatrix}\lambda_1 & 0\\0 & \lambda_2\end{bmatrix}$ $\det M=\lambda_1\lambda_2$ $trace\ M=\lambda_1+\lambda_2$<br>- formula – calculations of R – 4 M<br>Conclusion – harris corner -2M | 6 |
| | OR | |
| Q2 a | With suitable example describe how minimum distance classifier is used in classification task?<br>Euclidean distance eq – 1M<br>Explanation with example- 3M | 4 |
| Q2 b | Describe the SURF algorithm. Differentiate between SIFT and SURF features. Justify how the speed of operation is improved in SURF features?<br>SURF algorithm – 2M<br>Comparison between SIFT and SURF – 3M<br>How SURFis faster? - 1M | 6 |

| | | |
|---|---|---|
| Q.3 a | Identify and Comment on type of the noise from their histogram in the following image. Give the mathematical model for any one of the identified noise.<br>  <br>Sol- Erlang, Uniform and Impulse – 3M<br>PDfs – 3M | 4 |
| Q.3 b | With reference to JPEG scheme for Image compression, which block decides the compression ratio and the quality of the image after compression? Discuss how it does so?<br>JPEG block dig – 2M<br>Quantizer explanation – 4M | 6 |
| | OR | |
| Q.4 a | Justify that Weiner filter reduces to Inverse filter if the noise in the image is zero.<br>$\hat{F}(u,v) = \left[\frac{1}{H(u,v)}\frac{\lvert H(u,v)\rvert^2}{\lvert H(u,v)\rvert^2 + S_\eta(u,v)/S_f(u,v)}\right]G(u,v)$ - 2M<br>Explanation by making Sn =0 – 2M | 4 |
| Q.4 b | Refer the following image. Obtain the image after application of DCT transform. Analyze the energy of the image before and after transformation and comment on the result.<br>$\begin{bmatrix}2&2\\2&2\end{bmatrix}$ $\frac{1}{2}*\begin{bmatrix}1&1&1&-1\\1&1&1&-1\\1&1&1&-1\\-1&-1&-1&1\end{bmatrix}$ $\begin{bmatrix}4&0\\0&0\end{bmatrix}$<br>$\begin{bmatrix}2*1/2+2*1/2+2*1/2+2*1/2=4 & 2*1/2-2*1/2+2*1/2-2*1/2=0\\ 2*1/2+2*1/2-2*1/2-2*1/2=0 & 2*1/2-2*1/2-2*1/2+2*1/2=0\end{bmatrix}$<br>- 6M | 6 |
| | | |
| Q.5 a | Describe the video CODEC for H.264 and MPEG-4 Video Compression<br>Block diagram -2M<br>explanation -2M | 4 |
| Q.5 b | Refer following conversion formulae for RGB to YCbCr and YCbCr to RGB conversion. Compute the Y,Cb and Cr values for normalized Red color and justify that reverse transformation also gives the same green color. | 6 |

| | | |
|---|---|---|
| | $Y = 0.299R + 0.587G + 0.114B$ $\quad R = Y + 1.402Cr$<br>$Cb = 0.564(B - Y)$ $\quad G = Y - 0.344Cb - 0.714Cr$<br>$Cr = 0.713(R - Y)$ $\quad B = Y + 1.772Cb$<br><br>White color = [1 1 1 ] – 2M<br>Forward transform -2M<br>reverse transform -2M | |
| | OR | |
| Q.6 a | Justify that the interlaced scanning help reducing the flicker in video<br><br>Interlaced scanning – 2M<br>explanation hwo it reduces flicker – 2M | 4 |
| Q.6 b | Describe how block based approach is applied in video codec for motion estimation?<br>Block based motion estimation – 4M<br>How it is applied with distance measure – 2M | 6 |