Sardar Patel Institute of Technology
Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)
Academic year 2023-2024
Department of Electronics and Telecommunication Engineering

ESE May 2024

Subject : Consumer Electronics (OEET3)   **Sem VI**
Time : 3 hr.   **Max marks : 100**
Instructions : 1. All questions are compulsory.
                        2. Assume suitable data wherever necessary.
                        3. Draw Suitable diagram wherever necessary.

Q. No.	Questions	Marks	CO-BL
Q1 A)	You are a manufacturer developing a revolutionary new augmented reality (AR) device. Analyze the advantages and disadvantages of each display technology (OLED, alphanumeric, LED, LCD) and explain which one you would choose for your AR glasses. Justify your decision based on factors like resolution, power consumption, and suitability for AR applications.	07M	CO1 – II
B)	Illustrate the trade-offs between different touch panel technologies like resistive and capacitive touchscreens. Consider factors like cost, durability, accuracy, multi-touch capabilities, and suitability for different applications. When might one technology be preferable over the other? Draw suitable diagram.	08M	CO1 – II
Q2 A)	A master device (microcontroller) needs to send data to a specific slave device (sensor) on an I2C bus. Illustrate the essential steps involved in this I2C data transmission, focusing on the key signals and their functionalities.	07 M	CO3 - II
B)	A Wi-Fi network operates in the 5 GHz band using the 802.11ac standard and experiences a path loss of 60 dB at a distance of 10 meters. The transmitted power is 20 mW, and the receiver sensitivity is -80 dBm. 1. Calculate the received signal strength (RSSI) in dBm at a distance of 10 meters. 2. Estimate the maximum range of the network where the received signal strength meets the receiver sensitivity. 3. If the network uses 256-QAM modulation and a channel width of 80 MHz, what is the theoretical maximum data rate in Mbps?	08 M	CO3 - III
Q3 A)	Explain the following aspects of a color television camera system: 1. Briefly describe the role of a color circle in understanding color reproduction in a camera system. How does the camera differentiate between various colors? 2. Most color camera systems use a three-sensor approach to capture red, green, and blue (RGB) color information. However, they ultimately transmit a luminance (Y) signal and two chrominance (C) signals. Explain the concept of the Y signal using the formula: $$Y = 0.299R + 0.587G + 0.114B$$ What do the coefficients (0.299, 0.587, 0.114) represent? 3. Explain why and draw the amplitude of the Y signal would be different for the following color patterns displayed on the camera sensor.	10M	CO4 - II

		OR		
A)	Compare the key differences between standard definition television (SDTV) and HDTV. Explain how the increased resolution in HDTV contributes to a sharper and more detailed viewing experience. compare some of the common HDTV formats (e.g., 720p, 1080i) and their variations.	**10M**	**CO4 - II**
B)	In the early days of color television, a major hurdle was ensuring everyone could enjoy the new technology. How did engineers design color TV systems to be compatible with existing black-and-white televisions?	**05M**	**CO4 - II**
Q4 A)	Explain the basic characteristics of sound signals using appropriate definitions and examples. 1. Loudness 2. Pitch 3. Frequency Response 4. Fidility 5. Sensitivity of Human ear for Sound	**05M**	**CO2 - II**
B)	Design a new refrigerator with a single compartment. **Given:** The desired internal volume of the refrigerator is 200 liters (L). The insulation material you plan to use has a thermal conductivity (k) of 0.03 W/(m·K). The desired temperature difference between the inside (Ti) and outside (To) of the refrigerator is 15°C (Ti = 5°C, To = 20°C). The average surface area (A) of the refrigerator exposed to the surrounding air is estimated to be 3 m². **Objective:** 1. Determine the minimum thickness (x) of the insulation required to maintain the desired temperature difference. 2. Calculate the heat leak (Q) into the refrigerator per hour.	**10M**	**CO2 - III**
		OR		
B)	Design a microwave oven for reheating frozen meals. Your goal is to determine the appropriate magnetron power and cooking time to ensure safe and even heating of a frozen dinner (assumed to be a uniform block). **Given:** • Specific heat capacity of frozen meal (cp): 2 kJ/(kg*K) • Mass of frozen dinner (m): 0.3 kg • Initial temperature of frozen dinner (Ti): -18°C • Desired final temperature of the meal (Tf): 75°C • Microwave oven efficiency (η): 70% (percentage of magnetron power actually transferred to the food) **Objective:** 1. Calculate the energy required (E) to heat the frozen dinner to the desired temperature. 2. Determine the minimum magnetron power (P) needed to achieve the desired temperature within a specified cooking time (t).	**10M**	**CO2 - III**
Q5 A)	Using a labeled block diagram of a blood pressure monitor, explain the function of each major block involved in the measurement process. Also Mention any additional features the block diagram might represent, such as memory for storing readings or a communication interface for data transfer.	**10 M**	**CO5 - II**

B)	Draw a labeled diagram of an ECG waveform, and briefly explain the following components: P wave, PR interval, QRS complex, ST segment, QT interval, and T wave.	**10 M**	**CO5 - II**
Q6 A)	A retail store owner wants to install a new CCTV system to deter shoplifting and improve overall security. What factors should be considered when choosing CCTV cameras (resolution, night vision, etc.) and placement within the store? Describe the role of digital video recorders (DVRs) in CCTV systems.	**10 M**	**CO6 - II**
B)	You are tasked with improving safety and efficiency in a warehouse. Discuss the roles that printers, scanners, and projection systems can play in achieving this goal. 1. How could printers be used to create and distribute safety labels or hazard warnings? 2. How could scanners be used for inventory control and preventing product recalls? 3. Describe a scenario where a projection system might be used for safety training purposes.	**10 M**	**CO6 - II**