VIT
Vellore Institute of Technology
CHENNAI

Reg. Number:	21BEC1851

Continuous Assessment Test(CAT) – II OCT 2024

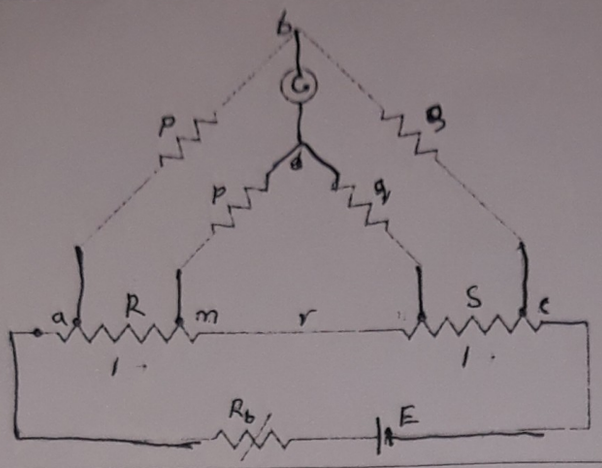
Programme	:	B.Tech (ECE/ECM)	Semester	:	Fall Semester 2023-24
Course Code & Course Title	:	Sensors Technology	Code	:	BECE409E
Faculty	:	Dr. MANIMARAN.P	Class Nbr	:	CH2024250100166
Duration	:	90 Mins	Slot	:	A1

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks	Blooms Taxonomy Level
1.		In a low-voltage Schering bridge designed for the measurement of permittivity, the branch ab consists of two electrodes between which the specimen under test may be inserted; arm bc is a non-reactive resistor R_3 in parallel with a standard capacitor C, arm cd is a non-reactive resistor R4 in parallel with a standard capacitor C_4; arm da is a standard air capacitor of capacitance C_2. Without the specimen between the electrodes, balance is obtained with the following values; C_3=C_4 = 100 pF, C_2 = 120 pF, R_3 =R_4 = 6000 Ohms. With the specimen inserted these values become C_3 =150 pF, C_4 =2000 pF, and R_3 = R_4 = 7000 Ohms. In each test ω= 4000 rad/s. Find the relative permittivity of the specimen.	10	K4
2.	i) ii) iii)	A Kelvin double bridge (shown in Fig) each of the ratio arms P = Q = p = q = 2000 Ohms. The emf of the battery is 100 V and a resistance of 5 Ohms is included in the battery circuit. The galvanometer has a resistance of 400 Ohms and the resistance of the link connecting the unknown resistance to the standard resistance may be neglected. The bridge is balanced when the standard resistance S = 0.002 Ohms. Determine the value of unknown resistance. (3 Marks) Determine the current (approximate value) through the unknown resistance R at balance. (2 Marks) Determine the deflection of the galvanometer when the unknown resistance, R, is changed by 0.1 percent from its value at balance. The galvanometer has a sensitivity of 100 mm/μA. (5 Marks)	10	K5

				
3.		Design an integrator circuit using an operational amplifier (Op-Amp) that satisfies the following specifications: • The input signal is a sine wave with peak amplitude of 1 V and a frequency of 1 kHz. • The integrator should output a triangular wave with peak amplitude of 5 V. • Use a power supply of ±12 V for the Op-Amp.	10	K4
4.		With the increasing demand for compact and highly sensitive MEMS and NEMS sensors, how do different micromachining techniques (such as bulk micromachining, surface micromachining, and high-aspect-ratio micromachining) affect the structural integrity and operational efficiency of these sensors? Provide examples of specific sensor applications that have benefited from advanced micromachining methods.	10	K2
5.	i) ii)	In modern healthcare, IoT-enabled devices and sensors have the potential to transform patient care, making monitoring and diagnostics more real-time, personalized, and efficient. However, there are still challenges in deploying Industrial IoT (IIoT) solutions at scale in healthcare due to concerns around data privacy, infrastructure costs, and integration with existing systems. Using a healthcare facility as a case study, evaluate how IIoT can be utilized to enhance patient monitoring, improve workflow automation, and reduce errors in medical procedures. (5 Marks) Examine a real-life example of an IIoT deployment in healthcare (e.g., remote patient monitoring, smart hospital rooms). Highlight the benefits and challenges encountered during implementation.(5 Marks)	10	K6

**********All the best **********