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MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

THIRD SEMESTER B. TECH. (INSTRUMENTATION AND CONTROL ENGG.) END SEMESTER DEGREE EXAMINATIONS, NOVEMBER - 2018

ELECTRICAL AND ELECTRONICS MEASUREMENTS [ICE 2102]

TIME: 3 HOUR

MAX. MARKS:50

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Instructions to candidates:(i) Answer ALL questions.(ii) Missing data may be suitably assumed.

- **1A** Explain two contributing characteristics which defines precision with examples.
- 1B With a block diagram explain the functional elements of a digital energy meter.1C Draw the circuit schematic and phasor diagram at balance condition of Anderson's bridge
- 1C Draw the circuit schematic and phasor diagram at balance condition of Anderson's bridge 5 highlighting its merits and demerits. Derive the expression for unknown constituent elements.
- 2A Explain the measurement of phase angle using CRO by two methods.
- **2B** The arms of a four arm bridge ABCD supplied with sinusoidal voltage have the following values 3 Arm AB: a resistance of 200Ω in parallel with a capacitance of $1\mu F$ Arm BC: 400Ω resistance, Arm CD: $1k\Omega$ resistance, Arm DA: a resistance of R_2 in series with $2\mu F$ capacitance. Determine the value of R_2 and the frequency at which the bridge will balance.
- **2C** Two currents from different sources flow in opposite directions through a resistor. I₁ is measured as 79mA on a 100mA analog instrument with an accuracy of $\pm 3\%$ of full scale. I₂, determined as 31mA measured on a digital instrument with a $\pm 100\mu$ A accuracy. Calculate the maximum and minimum levels of the current in R₁.
- **2D** An induction type single phase energy meter has a constant of 1000 rev/KWh. A heater of 2 KW is connected to this meter for the measurement of energy over a time period of 2 hours. If the meter makes 3000 revolutions during the period, find the % error of the meter if any.
- **3A** With a block diagram explain the working of different components of CRT.
- **3B** Explain the working of dual slope integrating type digital voltmeter with the diagram.
- **3C** With the block diagram and timing diagram explain the process of reciprocal counting.
- **4A** Sketch the basic circuits for converting inductance and capacitance into voltages for digital 4 measurements. Explain the operation of each set.
- **4B** The Q meter circuit is in resonance when E=200mV, R=3 Ω and $X_L=X_C=95\Omega$. Calculate the coil 2 Q factor and the voltmeter indication.
- **4C** With a schematic, explain the operation of strip chart x-y recorder.
- 5A Explain construction and working on LED displays. Compare the advantages and disadvantages 3 with that of LCDs.
- **5B** Explain the working of swept heterodyne spectrum analyzer with its diagram.
- **5C** Explain with necessary sketch, working of operational amplifier voltage regulator.
