ECE 181405 11/8/2 Roll No. of candidate BINA CHOWERUS Azara, Haikhowapara, 2022 Guwahati -781017 B.Tech. 4th Semester End-Term Examination INSTRUMENTAION (New Regulations & New Syllabus) Full Marks - 70 Time - Three hours The figures in the margin indicate full marks for the questions. Answer question No. 1 and any Four from the rest. 1. Answer the following (MCQ/ Fill in the blanks): $(10 \times 1 = 10)$ The brightest spot, on a cathode ray screen, occurs at The centre (a) The outer periphery (b) (c) Midway between centre and outer periphery of screen (d) Brightness is same all over the screen A C.R.O. can be used to measure (a) A.C. voltages only (b) D.C. voltages only (c) Frequency (d) Any of the above (iii) LVDT windings are wound on steel sheets(laminated) (b) aluminium (c) ferrite (d) copper (iv) Piezoelectric crystals are used for the measurement of (a) temperature velocity (b) (d) none of the above (c) sound In Maxwell's Inductance-Capacitance bridge, the frequency w (a) Is directly proportional to the inductance in the balanced equation Is inversely proportional to the capacitance in the balanced equation (c) Is directly proportional to the product of inductance and capacitance

Does not appear in the balanced equations

Total No. of printed pages = 4

(vi)	The Maxwell's Inductance-capacitance bridge is not suitable for the measurement inductance of coil if the Q factor is			
	(a)	Less than 1	(b)	Between 1 to 10
	(c)	More than 10	(d)	Both (a) and (c)
(vii)	For	lower accuracies		
	(a)	Digital acquisition system	is used	
	(b)	Both digital and analog a	cquisitio	n systems are used
	(c)	Analog acquisition system	is used	
	(d)	Mechanical data acquisiti	on system	m is used
(viii) Fin	d out the resolution of 8 bit	DAC/AL	OC? BINA CHOWDHURY CENTRAL LIBRA (GIMT & GIPS) Azera, Halkhowapara
	(a)	562	(b)	625 Guwahati -781017
	(c)	256	(d)	265
(ix)	A binary input 000 is fed to a 3bit DAC/ADC. The resultant output is 101. Find the type of error?			
	(a)	Settling error	(b)	Gain error
	(c)	Offset error	(d)	Linearity error
(x)	Which of the following is caused by careless handling?			
	(a)	Systematic error	(b)	Gross error
	(c)	Random error	(d)	None of the mentioned
(a)	What is the difference between accuracy, precision, resolution and sensitivity.			
(b)	Explain loading effect due to series and shunt connected instruments.			
(c)	Three resistors have the following ratings: R_1 =200 ±5% Ω , R_2 =100 ±5% Ω , R_3 50 ±5% Ω . Determine the magnitude of the resultant resistance and the limiting error in percentage and in ohms if the above resistances are connected in parallel.			
(d)	A dc circuit can be represented by an internal voltage source of 50 V with an output resistance of 100 k Ω . In order to achieve accuracy more than 99% for voltage measurement across its terminals, calculate the resistance of the voltage measuring device. [4+4+4+3=15]			

- 3. (a) Mention the disadvantages of Wheatstone bridge for the measurement of low resistance.
 - (b) With proper circuit diagram find the equation for the measurement of unknown resistance using Kelvin's double bridge.
 - (c) With proper circuit and phasor diagram find the equation for the measurement of unknown inductance using Hay's bridge.
 - (d) A sheet of Bakelite 4.5 mm thick is tested at 50 Hz between electrodes 0.12m in diameter. The Schering's bridge employs a standard air capacitor C_2 of 106 pF capacitance, a non reactive resistance R_4 of $1000/\pi\Omega$ in parallel with variable capacitor C_4 and a non reactive variable resistance R_3 . Balance is obtained with C_4 =0.5 μ F and R_2 = 260 Ω . Calculate the capacitance, power factor and relative permittivity of the sheet. (2+5+5+3=15)
- 4. (a) What do you mean by swamping resistance? PINA CHOWDHURY CENTRALLIBRARY
 - (b) What do you mean by burden voltage?
 - (c) With proper diagram explain the working of series ohmmeter. Also explain ohmmeter with zero adjust.
 - (d) Assume an ohmmeter circuit has E_B =1.5V, R_1 =15k, R_m =50, R_2 =50 Ω , and meter FSD = 50 μ A. determine the ohmmeter scale reading at 0.5 FSD, and determine a new resistance value that R_2 must be adjusted to when E_B falls to 1.3 V. Also recalculate the value of R_x at 0.5 FSD when E_B = 1.3 V.

[2+2+6+5=15]

- 5. (a) With diagram explain Binary weighted resistor DAC. What are its disadvantages?
 - (b) How the disadvantage of Binary weighted resistor DAC has been overcome in R-2R ladder DAC.
 - (c) Explain with diagram and an example of unknown weight the working of successive approximation ADC. [5+5+5=15]
- 6. (a) Mention the points that need to be considered in determining a transducer suitability for a specific measurement.
 - (b) With the help of a neat sketch explain the principle, working, construction, characteristics and application of LVDTs.
 - (c) A strain gauge has a gauge factor of 4. If the strain gauge is attached to a metal bar that stretches from 25 cm to 25.2 cm. Calculate the percentage change in its resistance. If the unstrained value of resistance is 120 ohm, what would be the value after strain is applied?
 - (d) A copper- constantan thermocouple has $\alpha = 37.5 \mu \frac{v}{c}$ and $\beta = 0.0045 \mu \frac{v}{c}$. Determine the emf developed by the thermocouple when its hot junction is at 200°C and cold junction is kept in ice. [3+6+3+3=15]

7. Write short notes on: (any three)

 $(3 \times 5 = 15)$

(a) GP-IB

(b) Q-meter

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- (c) Digital storage oscilloscope
- (d) Spectrum Analyzer