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RNLKWC/VIS/Ex Tech/DSE4T/22

End Semester Examination, 2022

Semester - VI

Experimental Techniques

PAPER - DSE4T

Full Marks : 60

Time : 3 Hours

PART - A

1. **Attempt any five questions :** **5x2=10**
- a) Write the major classifications of signals. 2
- b) Define vaccum system. Write down the different degree of vaccum system. 2
- c) Suppose you are to calculate U by measuring x and y, by using the formula $U=xy^n$, which quantity would you measure more accurately? 2
(where n is number, ≥ 2)
- d) What are advantages of a digital meter over an analogmeter? 2
- e) The viscosity (η) of a liquid is given by poiseuille's formula, $\eta = \frac{11Pa^4}{8vl}$. Assume that l and v can be measured very accurately. But the pressure (P) has an rms error of 1% and the radius (a) has an independent rms error of 3%. Find the rms error of viscosity. 2

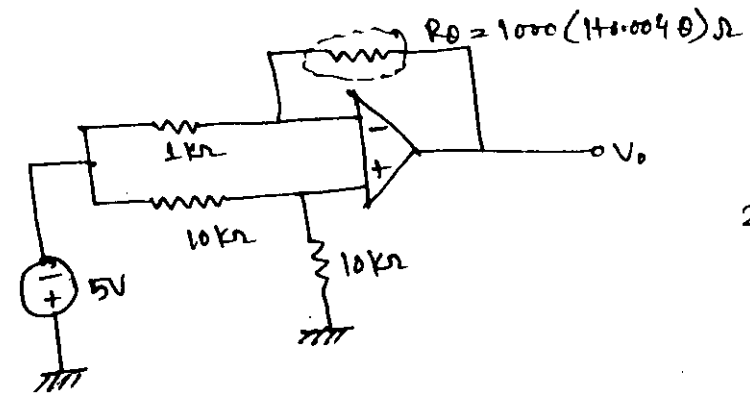
(Turn Over)

- f) The true value of a voltage is 100V. Values indicated by a measuring instrument are 104, 103, 105, 103 and 105 volts. Find the accuracy of measurement and precision of the instrument. 2
- g) What are various sources of random errors in the process of measurement? 2
- h) A receiver connected to an antenna whose resistance is 50Ω has an equivalent noise resistance of 30Ω . Calculate the receiver's noise figure in decibels. 2

PART - B

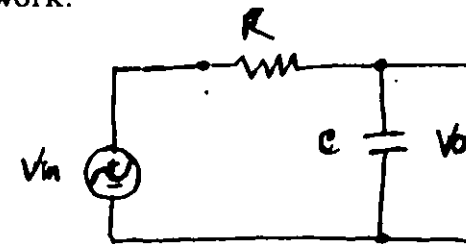
Attempt any 4 questions out of 6 : 4x5=20

2. Define Q meter. How can you measure L and C by a Q meter? 2+3
3. Obtain the Fourier transform of the following signals :-
- a) $x(t) = A \sin(2\pi f_c t) \cdot n(t)$
- b) $x(t) = f(t) \cos(2\pi f_c t + \phi)$ 2+3
- 4.a) A signal $m(t)$ varies from -3.5v to $+3.5\text{v}$ with an average power of 3w . The signal is quantised using a mid-tread type quantize and subsequently binary encoded. With the code word of length 3, what is signal to quantisation noise ratio in dB?
- b) In the circuit below, the OPAMP is ideal and the sensor is an RTD whose resistance $R_0 = 1000(1 + 0.004\theta) \Omega$, where θ is temperature in $^\circ\text{C}$. What is the output sensitivity in $\text{mv}/^\circ\text{C}$?



2+3

5. Define noise. Briefly describe the noise in the passive and active circuits. What do you mean by $1/f$ noise? 1+3+1
6. What do you mean by transfer function? Determine the transfer function and order of the given network. 3+4+3



7. What is an LVDT? Explain its working principle with necessary diagrams and characteristics. 1+4

PART - C

Descriptive Questions. Attempt any 1 questions out of 2 questions : 1x10=10

8. a) Draw the block diagram of digital multimeter. Discuss its working principle.

- b) Find the best fit straight Line corresponding to the following data :

x	1	3	5	7	9
y	10.7	13.1	15.2	17.6	19.6

- c) Two periodic signals $x(t)$ and $y(t)$ have the same fundamental period of 3 seconds. Consider the signal $z(t) = x(-t) + y(2t + 1)$

What is the fundamental period of $z(t)$ in seconds ?

$$5+2+3$$

9. a) What is an electrical transducer ? What are the basic requirements of a transducer ?
- b) Define standard deviation and variance. The age of five girls students are 18, 19, 20, 21, 22 years. Determine variance and standard deviation.

$$(1+3)+3+3$$