

Writing anything except roll number on question paper will be deemed as an act of indulging in unfair means and action shall be taken as per rules.

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| <b>4E030521</b> | Roll No.: .....   | Total No. of Pages: <b>3</b> |
|                 | <b>4E030521</b><br><b>B. Tech. IV Semester End-Term Examination (Main), June-2022</b><br><b>Branch: Electronics &amp; Communication Engineering</b><br><b>4EC4-05: Electronic Measurement &amp; Instrumentation</b> |                              |

Time: 3 Hours

Maximum Marks: 105

**Instructions to Candidates:**

The question paper is divided in three parts A, B & C.

- (i) **Part-A:** 7 Basics/Fundamentals related questions (without choice).
- (ii) **Part-B:** 5 Numerical/Analytical questions (with internal choice i.e. attempt one question either A or B from each question).
- (iii) **Part-C:** 5 Descriptive/Analytical/Problem Solving/Design questions (attempt any 3 out of 5).

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly. Use of following supporting material is permitted during examination:

1. \_\_\_\_\_ Nil \_\_\_\_\_

2. \_\_\_\_\_ Nil \_\_\_\_\_

### PART-A

(Basics/Fundamentals related questions)

All questions are compulsory

- Q.1 (a)** The Value of capacitance of a capacitor is specified as  $1\mu\text{F} \pm 5\%$  by the manufacturer. Find the limits between which the value of capacitance is guaranteed. [3]
- (b)** Write down the advantages of Electronic Voltmeters. [3]
- (c)** Define the Deflection sensitivity and Deflection factor. [3]
- (d)** Explain the working block diagram of basic element of a function generator. [3]
- (e)** Describe a signal generator using envelop feedback for amplitude modulation. [3]
- (f)** Explain the characteristics of Thermistors. [3]
- (g)** For a transducer, describe the following: [1]
- (i) Scale errors [1]
  - (ii) Noise and drift errors. [2]

### PART-B

(Numerical/Analytical questions)

- Q.2 (A)** The solution for the unknown resistance for a wheatstone bridge is : [6]

$$R_x = \frac{R_2 R_3}{R_1}$$

where  $R_1 = 100 \pm 0.5\% \Omega$

$R_2 = 1000 \pm 0.5\% \Omega$

$R_3 = 842 \pm 0.5\% \Omega$

Determine the magnitude of the unknown resistance and the limiting error in percent and in ohm for the unknown resistance  $R_x$ .

**OR**

**(B)** Define the following terms in the context of normal frequency distribution of data:

- (i) Mean value [1]
- (ii) Deviation [1]
- (iii) Average deviation [1]
- (iv) Standard deviation [1]
- (v) Variance. [2]

**Q.3 (A)** Explain the advantages of Electronic voltmeters over conventional type voltmeters are regards

- (i) Detection of low level signals [2]
- (ii) Power consumption [2]
- (iii) Loading effects [2]

**OR**

**(B)** Describe the circuit diagram and operation of an Electronic voltmeter using a difference amplifier. Explain the functions of zero setting and calibration resistors. Describe how the range of the voltmeter can be extended. [6]

**Q.4 (A)** An electrically deflected CRT has a final anode voltage of 2000 V and parallel deflecting plates 1.5 cm long and 5 mm apart. If the screen is 50 cm from the centre of deflecting plates, find:

- (i) beam speed [2]
- (ii) the deflection sensitivity of the tube [2]
- (iii) the deflection factor of the tube. [2]

**OR**

**(B)** Calculate the velocity of the electron beam in an oscilloscope if the voltage applied to its vertical deflection plates is 2000 V. Also calculate the cutoff frequency if the maximum transit time is  $\frac{1}{4}$  of a cycle. The length of horizontal plates is 50 mm. [6]

**Q.5 (A)** Describe the following :

- (i) Square wave generator with block diagram. [3]
- (ii) A heterodyne oscillator. [3]

**OR**

**(B)** Explain the principle of working of a negative resistance oscillator and describe the frequency range over which it is used. [6]

**Q.6 (A)** Define the following with reference to transducers :

- (i) Zero error [1]
- (ii) Sensitivity error [1]
- (iii) Non-conformity error [1]
- (iv) Hysteresis error [1]
- (v) Dynamic error [1]
- (vi) Cross sensitivity [1]

**OR**

**(B)** Describe the working and construction of resistance thermometers. Describe the materials used for RTDs, along with their properties. Sketch their typical characteristic. [6]

**PART-C**

**(Descriptive/Analytical/Problem Solving/Design questions)**

**(attempt any 3 out of 5) (Q.7 to Q.11)**

- Q.7** Current was measured during a test as 30.4 A, flowing in a resistor of  $0.105\Omega$ . [18]  
It was discovered later that the ammeter reading was low by 1.2 % and the marked resistance was high by 0.3 %. Find the true power as a percentage of the power that was originally calculated.
- Q.8** Explain and describe the following : [6]  
(i) Peak reading VTVM, of Series type and compensated shunt type. [6]  
(ii) Average reading VTVMs. Write down the advantages and disadvantages. [6]  
(iii) Differential amplifier using two FETs.
- Q.9** Explain in details the following accessories of cathode ray oscilloscopes : [6]  
(i) Calibrators [6]  
(ii) Cameras [6]  
(iii) Electronic switch
- Q.10** Describe the following : [9]  
(i) Working of a difference frequency distortion analysers with the help of a block diagram. [9]  
(ii) Basic circuit of a spectrum analyser.
- Q.11** An LVDT with a secondary voltage of 5 V has a range of  $\pm 25$  mm. [9]  
(i) Find the output voltage when the core is -18.75 mm for the centre. [9]  
(ii) Plot the output voltage versus core position for a core movement going from +18.75 mm to -10 mm.

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