B. Tech. (I Year) (Sem. II) (Main/Back) Examination, June/July - 2012
Common to All Branches of Engg.
(205(C)) Instrumentation Engg.

Time : **3** Hours]

[Maximum Marks : **80**
[Min. Passing Marks : **24**

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary.) Any data you feel missing suitably be assumed and stated clearly, Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. _____ Nil _____    2. _____ Nil _____

## UNIT - I

1  (a)  A certain quantity x is calculated from measured values of

a, b and c using the formula $x = K \dfrac{a^2}{b-c}$ where K is a constant.

The maximum change in each of the three measured quantity is $\Delta$. Determine the maximum limiting error in x.

8

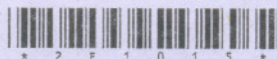(b)  What is systematic error ? Explain all kinds of systematic errors with the suitable example.

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### OR

1  (a)  The stress in a mild steel plat circular diaphragm is given

by  $S = \dfrac{3D^2 P}{16t^2} N/m^2$

where

D   Diameter of diaphragm, m

t   thickness of diaphragm m

P   applied pressure; $N/m^2$

A diaphragm has a diameter of 15 mm and the thickness of 0.2 mm and the applied pressure is $300 \times 10^3$ N/m$^2$. Calculate the stress. The known error in diameter is 1% and in thickness is 3%. Calculate the error in stress.

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(b) Prove that the algebraic sum of the deviations is equal to zero.

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# UNIT - II

2 (a) Describe the construction and working of an electronic voltmeter.

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(b) Explain the "Vector-Impedance Meter" with the suitable diagram.

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## OR

2 (a) An ideal diode has been connected across a 10 $\Omega$, 100 mA, centre zero PMMC meter as shown in Fig 2(a). Determine the reading of meter.
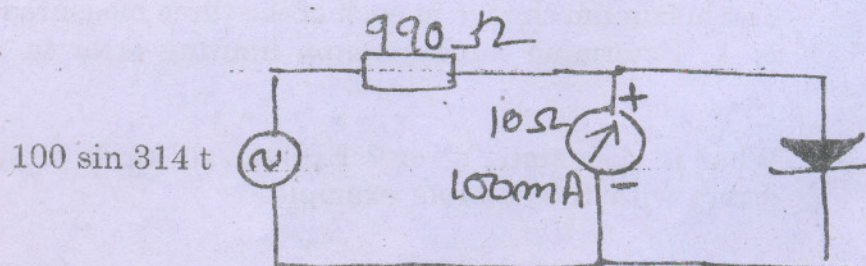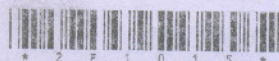
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Fig. 2[a].

(b) Draw the block diagram of basic digital voltmeter and explain the successive approximation type of digital voltmeter with neat sketch.

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## UNIT - III

3 Explain the following :

(a) CRO probes.

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(b) Oscilloscope techniques for measurement of frequency, phase angle and time delay.

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### OR

3 (a) What value should $C_1$ have for $V_o$ to be equal to $0.1\ V_i$ in the circuit shown in Fig. 3(a).
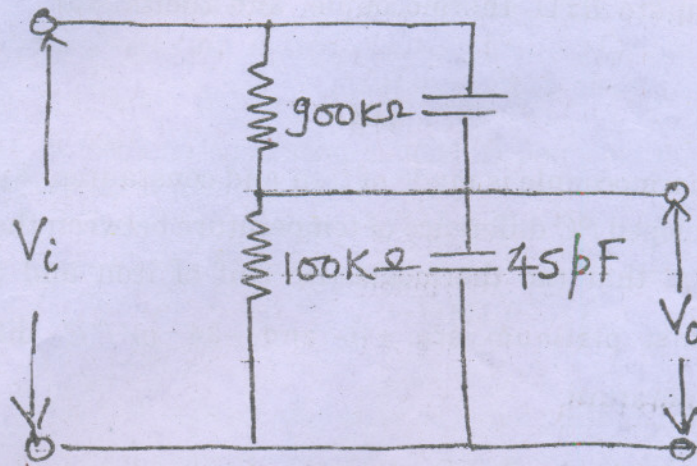


Fig. 3[a].

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(b) What is the role of following in CRO ?

(i) Sync Selector.

4

(ii) Trigger pulse circuit.

4

## UNIT - IV

4 (a) Classify the oscillators used into the signal generator according to the frequency range and explain them briefly.
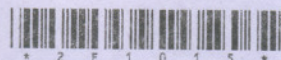
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(b) Explain the sine wave signal generator with the diagram.

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### OR

4   Explain following :
    (a)   Frequency synthesized signal generator.

                                                                            8

    (b)   Sweep frequency generator.

                                                                            8


# UNIT - V

5   (a)   Derive the expression of Gauge factor $G_f$ for the strain gauge.

                                                                            8

    (b)   Compare RTD, thermocouple, and thermistor.

                                                                            8


## OR

5   (a)   A thermocouple is made of iron and constantan. Find the emf
          developed /°C difference of temperature between the junctions.
          Given that the thermoelectric emf of iron and constantan
          against platinum are +16 and −34 $\mu V/°C$ difference of
          temperature.

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    (b)   What is load cell ? Explain the construction and working of
          load cell, with the neat diagram.

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