



College of Engineering, Science and Technology  
School of Electrical and Electronics Engineering

**Trade Diploma**  
( Electronic Instrumentation & Control )

## **EEE580 – Electronic Instrumentation**

Trimester 2, 2017

Date: 16 Aug. 2017      Time: 09:00AM to 12:10PM  
Duration – 3 h 10 min (Including 10 min reading time)

Total Marks – 100

### **Instructions to candidates:**

- 1) You are allowed 10 minutes extra reading time during which you are NOT allowed to write.
- 2) Begin each answer on a fresh page and use both sides of the sheet.
- 3) Write your candidate number at the top of each attached sheet.
- 4) Insert all written full-scape, graph paper, drawing paper etc. in their correct sequence and secure with string.
- 5) For all sheets of paper on which rough/ draft work has been done, cross it through and you must attach all of them to your answer scripts.
- 6) Write clearly the number(s) of the questions(s) attempted on the top of each sheet.
- 7) There are two sections – both are compulsory.
- 8) There are alternative sub-questions within some questions.
- 9) Start your answer for a new question on new page.
- 10) Use of mobile phones or other programmable electronic gadget/storage device is NOT ALLOWED

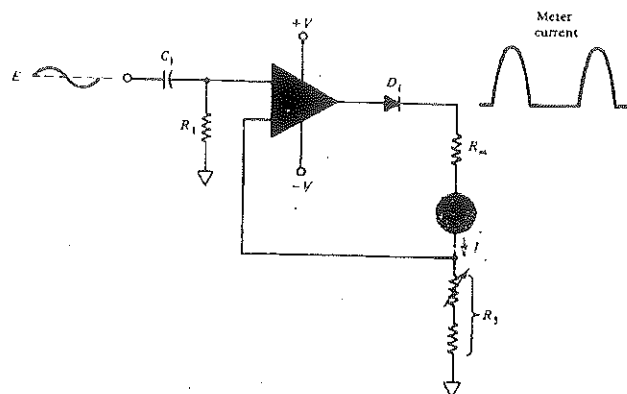
- *Total Number of pages – 05 (Five) including this cover page*

## SECTION A – SHORT ANSWER QUESTIONS

[Section A - Total 50 Marks]

Note: All questions in this section are compulsory.

- Q.1. Explain significance and need of measurement of absolute errors, relative errors, combinations error and statistical errors using suitable example. [05 Marks]
- Q.2. State different types of measurement standards used in calibration of instruments with suitable example. [05 Marks]
- Q.3. Explain the methods involved in instrument calibration. [05 Marks]
- Q.4. Explain the concept of DC ammeter and DC voltmeter using circuit diagrams. [05 Marks]
- Q.5. A permanent magnet moving coil (PMMC) instruments with a 250 turn coil has a magnetic flux density in its air gaps of  $B = 0.4\text{T}$ . The coil dimensions are  $D = 2\text{cm}$  and length  $= 3\text{cm}$ . Calculate the deflection torque on the coil for a current of  $2\text{mA}$ . [05 Marks]
- Q.6. Classify signal generators and analyzers used in various measurement applications. [05 Marks]
- Q.7. Draw and explain operations of full wave rectifier voltmeter. Show output waveform relationship using terms:  $V_{\text{peak}}$ ,  $V_{\text{rms}}$ , and  $V_{\text{avg}}$ . [05 Marks]
- Q.8. The half-wave rectifier electronic voltage to current convertor circuit uses a meter with a full scale deflection(FSD) current of  $1\text{mA}$  as shown in the circuit. The meter coil resistance is  $1.2\text{K}\Omega$ . Calculate the value of  $R_3$  that will give meter full scale pointer deflection when the ac input voltage is  $100\text{mV(rms)}$ . Determine the meter deflection when the input is  $150\text{mV}$ . [05 Marks]



[05 Marks]

**Q.9.** i) State and explain different types of multimeter probes used for various measurements.

[03 Marks]

ii) A PMMC instrument (DC Ammeter) has full scale deflection (FSD) of  $150\mu\text{A}$  and coil resistance of  $2\text{K}\Omega$ . Determine the required shunt resistance value to convert the instrument into an ammeter with FSD= $180\text{mA}$  and FSD= $1\text{A}$ .

[02 Marks]

**Q.10.** Explain the operation of decade counter used in digital meters with a suitable diagram.

[05 Marks]

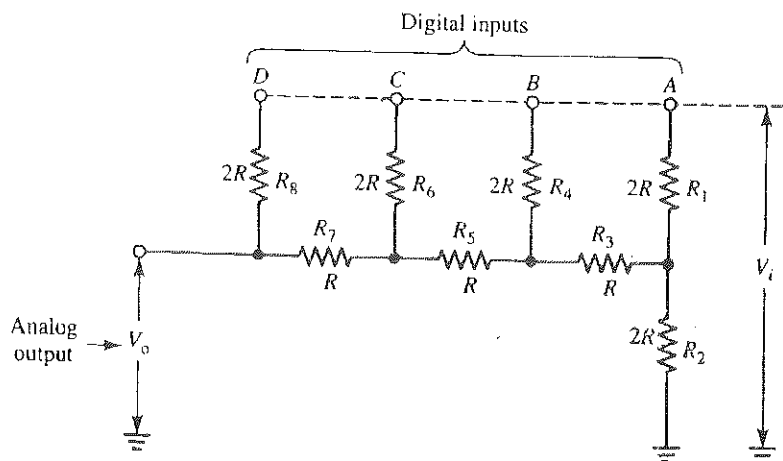
*\*\*\* End of Section A \*\*\**

## SECTION B – LONG ANSWER QUESTIONS

[Section B - Total 50 Marks]

Note: Attempt any FIVE out of the following EIGHT questions from this section.

- Q.11.** State different types of electromechanical instruments. State and explain working principle of PMMC instruments and its applications. [10 Marks]
- Q.12.** i) Explain Ohm meter operation as an electronic instrument. State how the range of electronic voltmeter is determined in a series ohm meter circuit? [06 Marks]
- ii) An instrument that indicates  $100\ \mu\text{A}$  at full scale deflection (FSD) has a specified accuracy of  $\pm 2\%$ . Calculate the upper and lower limits of measured current and the percentage error in the measurement for FSD and 0.5 FSD. [04 Marks]
- Q.13.** i) Illustrate working of operational amplifier based voltmeter circuit. [06 Marks]
- ii) Operational amplifier non-inverting voltmeter is required to measure a maximum input of  $40\text{mV}$ . The op-amp input current is  $0.4\ \mu\text{A}$ , and the meter circuit has  $I_m=150\ \mu\text{A}$  FSD and  $R_m=15\text{K}\Omega$ . Find out suitable resistance values for  $R_3$  and  $R_4$ . [04 Marks]
- Q.14.** i) Explain operation of digital frequency meter in detail. [07 Marks]
- ii) Digital to analog convertor (DAC) using R-2R ladder circuit as shown in the figure, It has 04 digital inputs, such as  $A=1, B=1, C=0$  and  $D=1$ . The input voltage is  $5\text{volt}$ . Calculate output Analog voltage of DAC. [03 Marks]



**Q.15.** State the various types of parameters measured using basic and special oscilloscopes. Draw and explain working of cathode ray oscilloscope.  
**[10 Marks]**

**Q.16.** Draw and derive expression of AC bridge suitable for measurement of unknown inductance. Explain its advantages & applications.  
**[10 Marks]**

**Q.17.** What are the various digital display elements and Graphical recording instruments used in measuring instruments? Draw and Explain strip chart recorder instrument.  
**[04+06=10 Marks]**

**Q.18.** Draw and explain working of **Any One** of the following. State its important technical parameters.

- i) Function generator
- ii) Calibration of Ammeter , Voltmeter & Wattmeter

**[10 Marks]**

**\*\*\* End of Section B \*\*\***

**\*\*\*\*\* End of Question Paper \*\*\*\*\***