

II B.Tech. I Semester Regular Examinations, November -2005
ELECTRICAL AND ELECTRONICS MEASUREMENTS
(Instrumentation & Control Engineering)

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain about the loading effect in measurements and its effect on the accuracy of measurement. How this can be prevented? [6+2]
(b) A voltmeter with a sensitivity of $1000\Omega/\text{v}$ is being used, to measure the voltage across a $40\text{ k}\Omega$ resistor. The voltage is measured on 50v range. Determine the error in the reading due to loading effect. [8]
2. (a) Explain principle and working of power factor meter. [10]
(b) Calculate the value of series resistance required to extend the 0-150V range of a $22,000\Omega/\text{V}$ meter to 0-1000V? Also find the power rating. [4+2]
3. (a) Explain a ramp type digital volt meter using voltage to time conversion principle.
(b) A dual slope integrating type of A/D converter has an integrating capacitor of $0.1\text{ }\mu\text{F}$ and a resistance of $100\text{ K}\Omega$ if the reference voltage is 2 volt and the output of the integrator is not to exceed 10 volts, what is the max time the reference voltage can be integrated. [10+6]
4. (a) Write notes on RF power and voltage measurement.
(b) Compare R.F. analog and digital powers measurements. [10+6]
5. (a) With neat block diagram explain the working function of each block of general purpose oscilloscope.
(b) Mention the advantages of general purpose oscilloscope. [10+6]
6. (a) Explain the working function of each blocks of a digital storage oscilloscope.
(b) How does the digital storage oscilloscope differ from the conventional storage oscilloscope using a storage CRT? What are the advantages of each? [8+8]
7. (a) What are the precautionary measures to be considered in a signal generator. And how can they be achieved?
(b) Discuss in detail about RF signal generators. [6+10]
8. (a) Explain with the help of a block diagram how the period can be measured?
(b) What is meant by time base error and explain a calibration method to improve the accuracy of it. [10+6]

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1. Explain in detail the analog type multimeter, with moving coil mechanism with relevant diagram. [10+6]
2. (a) Explain in detail the measurement of power using electro-dynamometer.
(b) Write short notes on watt-hour meter. [8+8]
3. (a) Give a circuit of an AC coupled amplifier to amplify DC signals when the input and out put are chopped.
(b) Explain the operation of an all-electrical chopper circuit using FET's. [8+8]
4. (a) Compute the value of self-capacitance of a coil when the following measurements are made; at $f_1 = 2\text{MHz}$, the tuning capacitor is set at 450 pf. When the frequency is increased to 5 MHz, the tuning capacitor is tuned to 60 pf.
(b) Draw the block diagram of the RF milli voltmeter. Explain its working. [6+10]
5. (a) With neat block diagram explain the working function of each block of general purpose oscilloscope.
(b) Mention the advantages of general purpose oscilloscope. [10+6]
6. (a) How does the sampling oscilloscope increase the apparent frequency response of an oscilloscope?
(b) What precautions must be taken when using a sampling oscilloscope? [10+6]
7. (a) Distinguish between spectrum analyzer and wave analyzer.
(b) Explain in detail about different characteristics of a signal generator. [8+8]
8. (a) Explain with the help of a block diagram how the period can be measured?
(b) What is meant by time base error and explain a calibration method to improve the accuracy of it. [10+6]

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1. Derive the expression for shunt resistance for both DC ammeter and series resistance for DC voltmeter and also discuss their types in detail. [6+6+4]
2. (a) With a neat sketch explain the principle and works of thermocouple meter. Mention advantages. [8]
(b) The multimeter movement has an internal resistance of 150Ω and requires 1.5mA for full-scale deflection. Two diodes D_1 and D_2 have an average forward resistance of 500Ω each. An R_{sh} is placed across the meter with 150Ω . The diode offer infinite resistance when reverse biased. For a 15V a.c range calculate
 - i. The multiplier value R_s .
 - ii. The Sensitivity of voltmeter on the a.c range.[5+3]
3. (a) Give a block diagram of a true reading voltmeter. Explain the use of thermo couples used
(b) A 25 Milliamps full-scale current meter with an internal resistance of 100 Ohms Give a block diagram of a true reading voltmeter. Explain the use of thermo couples used is available for constructing an AC voltmeter with a voltage range of 200 V rms . Using 4 diodes in a bridge arrangement where each diode has a forward resistance of 500 ohms and infinite reverse resistance, calculate the necessary series limiting resistance for the 200 V rms range [8+8]
4. (a) Compute the value of self-capacitance of a coil when the following measurements are made; at $f_1 = 2\text{MHz}$, the tuning capacitor is set at 450 pf . When the frequency is increased to 5 MHz , the tuning capacitor is tuned to 60 pf .
(b) Draw the block diagram of the RF milli voltmeter. Explain its working. [6+10]
5. (a) With neat block diagram explain the working function of each block of general purpose oscilloscope.
(b) Mention the advantages of general purpose oscilloscope. [10+6]
6. (a) With a neat block diagram explain working operation of storage oscilloscope.
(b) Compare storage oscilloscope with ordinary oscilloscope. [10+6]
7. (a) Explain the different types of distortions caused by amplifiers.
(b) Describe the Engineering applications of wave analyzers. [8+8]

8. (a) Draw and explain the logic diagram of a time base used for a frequency counter.
(b) Draw and explain the input signal processing circuit for the frequency counter.
(c) Define gating error. [8+6+2]

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1. (a) How do you extend the range of a given voltmeter? Draw the circuit and derive the expressions for the component values to be used. [4+4+4]
(b) Explain about Ayrton shunt used in ammeters. [4]
2. (a) With a neat sketch explain the principle and works of thermocouple meter. Mention advantages. [8]
(b) The multimeter movement has an internal resistance of 150Ω and requires 1.5mA for full-scale deflection. Two diodes D_1 and D_2 have an average forward resistance of 500Ω each. An R_{sh} is placed across the meter with 150Ω . The diode offer infinite resistance when reverse biased. For a 15V a.c range calculate
 - i. The multiplier value R_s .
 - ii. The Sensitivity of voltmeter on the a.c range.[5+3]
3. (a) Explain a resistance range selector circuit of a VOM.
(b) To check the distributed capacitance of a coil, the coil is resonated at 15MHz with 40PF . What is the inductance of the coil and what is the equivalent distributed capacitance. [8+8]
4. (a) How do you measure R, L and C using electronic instruments?
(b) How do you perform all-electronic capacitance measurements where the measurement is not performed by a comparison? Explain one method in detail. [8+8]
5. (a) With neat block diagram explain the working function of each block of general purpose oscilloscope.
(b) Mention the advantages of general purpose oscilloscope. [10+6]
6. (a) What are the relationships between the period of a waveform and its frequency? How is an oscilloscope used to determine frequency?
(b) How are the effects of direct current on the flux density of the current probe minimized? [10+6]
7. (a) What is the difference between a wave analyzer and harmonic distortion analyzer?

- (b) Explain with the help of block diagram the working of a harmonic distortion analyzer? [8+8]
8. (a) Draw and explain the logic diagram of a time base used for a frequency counter.
- (b) Draw and explain the input signal processing circuit for the frequency counter.
- (c) Define gating error. [8+6+2]
