

II B.Tech Supplementary Examinations, Aug/Sep 2008
ELECTRICAL AND ELECTRONIC MEASUREMENTS
(Electronics & Control Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) How is the current range of a PMMC instrument extended with the help of shunts?
(b) Explain a method of reducing errors due to temperature changes in the shunt connected instruments with a suitable example. [8+8]
2. (a) Explain how an electro-dynamometer type of instrument is able to measure the true r.m.s value of a voltage (or) current irrespective of its wave form.
(b) What are the advantages and dis-advantages of electro-dynamometer type of instruments? [8+8]
3. (a) Explain the principle of operation of 1- ϕ induction type energy meter with a neat circuit diagram.
(b) The meter constant of a 230V, 10A watt hour meter is 1800 revolutions per Kwh. The meter is tested at half load and rated voltage and unity power factor. The meter is found to make 80 revolutions in 138 sec. Determine the meter error at half load? [10+6]
4. (a) Explain the importance of thermocouples in the construction of true RMS type of Voltmeter.
(b) What is the necessity of electronic voltmeter? Explain.
(c) What is multimeter? What are the parameters that can be measured with multimeter? [6+6+4]
5. (a) What is phase meter? Mention its type. Discuss the merits and demerits of it.
(b) With a neat sketch explain the operation of digital phase meter. [8+8]
6. (a) What is probe? What are the advantages of an active voltage probe?
(b) Why an attenuator probe is used in oscilloscope .
(c) What is delayed sweep? when it used? [8+4+4]
7. (a) Explain how sine wave is generated from signal generator? Draw the circuit and explain its working.
(b) Explain how square and triangular wave is generated from signal generator? Draw the circuit and explain its working. [8+8]
8. (a) List the different measurement errors and discuss in brief.

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- (b) Draw the block diagram of a frequency counter and explain its operation using appropriate wave forms. [8+8]

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1. (a) Give the general requirements for the construction of shunts?
(b) Explain the working of a universal shunt used for multirange Ammeters. Derive expressions for resistances of different sections of a universal shunt used for a 3 range ammeter. [6+10]
2. Explain the construction and working of a shunt type ohmmeter. Write down its design equations. Why are series type ohmmeters preferred over shunt type ohmmeters? [16]
3. (a) Define the following terms as used for instrument transformers.
 - i. Transformation ratio
 - ii. Nominal ratio
 - iii. Turns ratio
 - iv. Ratio correction factor and
 - v. Burden.(b) State the advantages and dis-advantages of instrument-transformers. [10+6]
4. (a) Explain how Successive approximation DVM performance is better than other DVM's.
(b) Compare the performance characteristics of different types of DVMs. [8+8]
5. Draw the basic blocks of RF vector impedance meter. Explain the functions of each block. Also give the specifications of the above meter. [16]
6. (a) What is probe? What are the advantages of an active voltage probe?
(b) Why an attenuator probe is used in oscilloscope .
(c) What is delayed sweep? when it used? [8+4+4]
7. Describe the circuits and working principle of wave analyzer used for radio frequency and also in Megahertz's ranges. Give the specification and mention the advantages and disadvantages of it. [16]
8. (a) List the different measurement errors and discuss in brief.
(b) Draw the block diagram of a frequency counter and explain its operation using appropriate wave forms. [8+8]

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1. (a) Explain the constructional details of PMMC instruments with a neat sketch.
(b) Explain different errors of PMMC instruments. [10+6]

2. A series type of ohmmeter uses a 50Ω basic movement requiring a full scale current of 1mA. The internal battery voltage is 3V. The desired scale marking for half scale deflection is $2,000\Omega$. Calculate
 - (a) the values of R_1 and R_2 .
 - (b) the maximum value of R_2 to compensate for a 10% drop in battery voltage.
 - (c) the scale error at the half scale mark ($2,000\Omega$) when R_2 is set as in (ii). [16]

3. (a) Explain the following in an $1-\phi$ induction type energy meter?
 - i. Driving system
 - ii. Moving system.
 - iii. Braking system and
 - iv. Registering mechanism.(b) A 50A, 230V meter on full load test makes 61 revolution in 37 sec. If the normal disc speed is 520 revolution per Kwh, find the percentage error?[12+4]

4. (a) Explain the importance of thermocouples in the construction of true RMS type of Voltmeter.
(b) What is the necessity of electronic voltmeter? Explain.
(c) What is multimeter? What are the parameters that can be measured with multimeter? [6+6+4]

5. (a) What is phase meter? Mention its type. Discuss the merits and demerits of it.
(b) With a neat sketch explain the operation of digital phase meter. [8+8]

6. (a) What are the precautions to be taken while using a sampling oscilloscope.
(b) What is the velocity of the electrons that have been accelerated through a potential of 100V.
(c) Mention the applications of CRO. [6+5+5]

7. (a) Discuss in detail about Audio frequency wave generator.

- (b) What are the precautionary measures to be considered in a signal generator?
Explain how they can be achieved. [9+7]
8. (a) Justify what minimum gate is required for a frequency counter capable of measuring an unknown frequency, to within 10Hz by measuring frequency rather than period?
- (b) What is meant by time base error and explain a calibration method to improve the accuracy of it? [16]

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1. (a) State the causes of change of accuracy in PMMC instruments?
(b) The resistance of a moving coil voltmeter is 12,000 Ω . The moving coil has 100 turns and 4 cm long and 3 cm wide. The fluxdensity in the air gap is 6×10^{-2} wb/m². find the deflection produced by 300 V if the spring control gives a deflection of one degree for a torque of 25×10^{-7} N-m. [8+8]
2. (a) Explain the principle of operation of thermoelectric instruments?
(b) Give the constructional details of thermoelectric instruments. [8+8]
3. Explain the construction and working of a 3-phase electro-dynamometer type of power factor meter. [16]
4. (a) Explain the importance of thermocouples in the construction of true RMS type of Voltmeter.
(b) What is the necessity of electronic voltmeter? Explain.
(c) What is multimeter? What are the parameters that can be measured with multimeter? [6+6+4]
5. (a) Compute the Self capacitance of a coil when the following measurements are made at $f_1=2$ MHz the tuning capacitor is set at 450pF. When the frequency is increased to 5MHz, the tuning capacitor is tuned to 60pF.
(b) What are the advantages of Q-meter over other meters. [10+6]
6. (a) What is probe? What are the advantages of an active voltage probe?
(b) Why an attenuator probe is used in oscilloscope .
(c) What is delayed sweep? when it used? [8+4+4]
7. (a) What is distortion factor? Derive formula for the same.
(b) Draw the block diagram of Spectrum analyzer of the swept receiver design and explain it. [8+8]
8. (a) List the different measurement errors and discuss in brief.
(b) Draw the block diagram of a frequency counter and explain its operation using appropriate wave forms. [8+8]
