

CBCS Scheme

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15EE36

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018

Electrical and Electronic Measurements

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. All symbols and anonyms have their usual meaning.

Module-1

- 1 a. Derive the dimensions of the following quantities with mass, length, time and current as the fundamental units :
- i) Inductance ii) Capacitance iii) Electric Flux iv) Resistance v) Resistivity. (06 Marks)
- b. Illustrate with neat sketch, Kelvin double bridge to measure the internal resistance of an ammeter accurately. (06 Marks)
- c. The Thevenin's equivalent voltage of a Wheatstone bridge is 25mV and the galvanometer current is 20 μ A. The resistance of the galvanometer is 50 Ω . The ratio arms have resistances of 1000 Ω and 5000 Ω respectively. Find the value of the standard resistance for which the above conditions are satisfied. The value of the resistance to be measured is 600 Ω . (04 Marks)

OR

- 2 a. Discuss the fall of potential method of measurement of earth resistance. (04 Marks)
- b. With the neat circuit diagram, describe the operation of Maxwell Wein Bridge. List its merits and demerits. (06 Marks)
- c. Discuss the method of determining capacitance and dissipation factor using how voltage Schering bridge. (06 Marks)

Module-2

- 3 a. Discuss the errors and their compensating techniques used in dynamometer type Wattmeter. (05 Marks)
- b. Discuss the constructional features and working principle of rotating type phase sequence indicator. (06 Marks)
- c. A three phase induction motor draws a power input at a voltage of 250V, 20A and 0.8 power factor lag. Find percentage error in Wattmeter reading if :
- i) Pressure coil is on supply side
- ii) Current coil is on supply side
- Assume current coil resistance and pressure coil resistance = 0.2 Ω and 5000 Ω . (05 Marks)

OR

- 4 a. Discuss the construction and working principle of electrodynamicometer type single phase power factor meter. (06 Marks)
- b. Explain the errors in a LPF wattmeter and give the adjustments done to compensate for the errors. (05 Marks)
- c. Explain the working principle of Weston frequency meter. (05 Marks)

Important Note : 1. On completing your answer, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-3

- 5 a. Discuss the procedure used to extend the range of DC ammeter and DC volt meter using shunts and multipliers. (07 Marks)
- b. Describe the operation of a current transformer using a phasor diagram. Differentiate a current transformer from a potential transformer. (09 Marks)

OR

- 6 a. A moving coil instrument has a resistance of 50Ω and gives a full scale reading of 50mA. Calculate :
 i) The shunt resistance required to increase the range to 200A
 ii) The series resistance required to use it as a voltmeter of range 0 – 750V
 iii) Power consumed in both the cases. (09 Marks)
- b. Describe the operation of potential transformer using equivalent circuit and phasor diagram. (07 Marks)

Module-4

- 7 a. Using a block diagram schematic, explain the working of an electronic energy meter. List the drawbacks of traditional energy meter. (08 Marks)
- b. With a neat sketch explain the working of the following :
 i) True rms reading voltmeter
 ii) Q meter. (08 Marks)

OR

- 8 a. With neat sketch, explain the working of the following
 i) Integrating type DVM
 ii) Ramp type DVM. (08 Marks)
- b. Explain the working of electronic multimeter. (08 Marks)

Module-5

- 9 a. With a neat sketch explain the working of cathode ray tube. (08 Marks)
- b. With a neat sketch explain the working of the following :
 i) LED display
 ii) LCD display. (08 Marks)

OR

- 10 a. With appropriate sketch explain the working of strip chart recorder. (08 Marks)
- b. Write short notes on the following :
 i) X – Y recorders
 ii) LVDT type recorder. (08 Marks)

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Electrical & Electronic Measurement

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Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Derive the dimensions of resistance, inductance and capacitance in LMTI systems. (06 Marks)
 b. Define the sensitivity of wheat stone's bridge, with the necessary circuit diagram. Hence deduce the expression for sensitivity of the bridge 'SB'. (06 Marks)
 c. Explain sources and detectors used in AC bridges. (04 Marks)

OR

- 2 a. Expression for mean torque of an electro-dynamometer type of wattmeter is given by $T_d \propto M^a E^b Z^c$.
 M – Mutual inductance between fixed and moving coil.
 E – applied voltage
 Z – Impedance of load circuit.
 Determine value of a, b and c using dimensional analysis. (05 Marks)
 b. Derive the balancing equation for Kelvin's double bridge. (06 Marks)
 c. A sheet of Bakelite 4.5 mm thick is tested at 50 Hz between electrodes 0.12 m in diameter. The schering bridge employs a standard air capacitor C_2 of 106 p.f. capacitance, a non reactive resistance R_4 of $\frac{1000}{\pi} \Omega$ in parallel with a variable capacitor C_4 and non-inductive variable resistance R_3 . Balance is obtained with $C_4 = 0.5 \mu F$ and $R_3 = 260 \Omega$. Calculate the capacitance, power factor and relative permittivity of the sheet. (05 Marks)

Module-2

- 3 a. Derive the torque equation of single phase electro-dynamometer type wattmeter. (06 Marks)
 b. Explain the principle of operation of 10 W power factor wattmeter. (06 Marks)
 c. If the reading on two wattmeters in 3-phase balanced load are 836 and 224 W, the latter reading being obtained after the reversal of current coil connections, calculate the power p.f. of the load. (04 Marks)

OR

- 4 a. Discuss the various adjustments required in energy meter for the accurate reading. (06 Marks)
 b. A single phase kwhr meter makes 500 revolutions per kwhr. It is found on testing as making 40 revolutions in 58.1 seconds at 5 kw full load. Find out the percentage error. (04 Marks)
 c. With the help of neat sketch, explain the construction and working of Weston frequency meter. (06 Marks)

Module-3

- 5 a. What is shunt? How it is used to extend the range of an ammeter? (05 Marks)
 b. A moving coil meter gives a full scale deflection with a current of 5 mA. If the coil of the instrument has the resistance of 10 Ω , how it can be adopted to work as, (i) Ammeter of range 0 – 10 A (ii) Voltmeter of range (0 – 10 V). (06 Marks)
 c. Write a note on turns compensation used in instrument transformers. (05 Marks)

OR

- 6 a. With neat circuit diagram, explain Silsbee's method of testing C.T. (06 Marks)
 b. Explain the wattmeter method of measuring the iron loss. (05 Marks)
 c. Explain Hop Kinson's permeameter. (05 Marks)

Module-4

- 7 a. With a block diagram, explain the working of a true R.M.S responding voltmeter. (06 Marks)
 b. With a neat diagram, explain the working of an electronic multimeter. (06 Marks)
 c. What are the errors in the measurement of Q-factor of a coil? Explain. (04 Marks)

OR

- 8 a. With a block diagram, explain the working of a Ramp type DVM. (06 Marks)
 b. A coil with a resistance of 12Ω is connected in the direct connection mode of Q meter. Resonance occurs when the oscillator frequency is 1 MHz and the resonating capacitor is set at 75 pf. Calculate the % error introduced in the calculated value of Q by the 0.02Ω insertion resistance. (05 Marks)
 c. With a neat block diagram, explain the principle of working of electronic energy meter. (05 Marks)

Module-5

- 9 a. Explain LED and LCD displays. (08 Marks)
 b. Write a short note on nixie tube. (04 Marks)
 c. Write a short note on stripchart recorder. (04 Marks)

OR

- 10 a. With a neat sketch, explain the working of a X-Y recorder. (06 Marks)
 b. With the help of neat block diagram, explain ECG machine. Write important features of ECG machine. (08 Marks)
 c. Write the features of EEG. (02 Marks)

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CBCS Scheme

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15EE36

Third Semester B.E. Degree Examination, June/July 2017 Electrical & Electronic Measurements

Time: 3 hrs.

Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Derive the dimensions of, (i) emf (ii) Magnetic flux density (iii) Electric flux density (iv) Current density (v) Permeability (vi) Resistivity in LMTI system of dimensions. (06 Marks)
- b. With neat sketch, explain the operation of the Megger. (06 Marks)
- c. The four impedances of ac bridge are $z_1 = 400 \angle 50^\circ \Omega$, $z_2 = 200 \angle 40^\circ \Omega$, $z_3 = 800 \angle -50^\circ \Omega$, $z_4 = 400 \angle 20^\circ \Omega$. Find out whether the bridge is balanced under these condition or not. (04 Marks)

OR

- 2 a. Mention the applications and limitations of wheatstone bridge. (06 Marks)
- b. With neat circuit diagram, explain the operation of modified Desautys bridge. (06 Marks)
- c. Show that $w^2 LC$ is non dimensional, w being the angular frequency of the applied voltage. (04 Marks)

Module-2

- 3 a. What are the errors and adjustments in dynamometer type wattmeter? (06 Marks)
- b. With a neat sketch, explain the operation of Weston frequency meter. (05 Marks)
- c. A 230 V single phase watt-hour meter has a constant load of 4 A passing through it for 6 hrs at unity power factor. If the meter disc makes 2208 revolution during this period. What is the meter constant in revolution per kwh? Calculate the power factor of the load if the number of revolution made by the meter are 1472 when operating at 230 V, 5 A for 4 hrs. (05 Marks)

OR

- 4 a. Explain the operation of LPF dynamometer type wattmeter. (06 Marks)
- b. Explain the working principle and construction of single phase electro-dynamometer power factor meter. (06 Marks)
- c. Write a note on phase sequence indicator. (04 Marks)

Module-3

- 5 a. Describe with neat sketch measurement of iron loss using wattmeter method. (06 Marks)
- b. Explain the construction and working principle of a power transformer. (06 Marks)
- c. Write a note on turns compensation used in current transformer. (04 Marks)

OR

- 6 a. What are shunts and multipliers? Derive an expression for shunts and multipliers with reference to the meters used in electric circuit. (06 Marks)
- b. Explain the measurement of leakage factor using search coil. (06 Marks)
- c. What are the advantages of instrument transformer? (04 Marks)

Module-4

- 7 a. Explain the operation of true rms reading voltmeter. (06 Marks)
b. Explain with the help of block diagram the function of integrating type digital voltmeter. (06 Marks)
c. Write a note on performance parameters of digital voltmeter. (04 Marks)

OR

- 8 a. Explain the operation of successive approximation digital voltmeter. (06 Marks)
b. With a neat block diagram, explain the principle of working of electronic energy meter. (06 Marks)
c. Mention the advantages of electronic instruments over conventional meters. (04 Marks)

Module-5

- 9 a. Explain with suitable circuit diagram working of an cathode ray tube (CRT). (06 Marks)
b. Explain the principle of operation of galvanometer recorder and state its advantages. (06 Marks)
c. Write a note on display devices. (04 Marks)

OR

- 10 a. Explain the block diagram of an Electro Cardio Graph (ECG). (06 Marks)
b. Write a note on:
(i) Dot matrix display. (06 Marks)
(ii) Bar matrix display. (04 Marks)
c. Distinguish between frequency modulation recording and direct recording. (04 Marks)

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