

Registration No. :

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Total number of printed pages – 3

B. Tech
PCEE 4204

Third Semester Regular Examination – 2014
ELECTRIC AND ELECTRONICS MEASUREMENT
BRANCH(S) : AEIE, EC, EIE, ETC, IEE

QUESTION CODE : H 392

Full Marks – 70

Time – 3 Hours

*Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right-hand margin indicate marks.*

1. Answer the following questions : 2×10
- What do you understand by accuracy and precision of a measurement ?
 - What are the three major categories of error ? Explain any one of them in brief.
 - What are the methods used to measure high resistances ?
 - Why Hay's bridge is used? Write down two advantages of Hay's bridge ?
 - How is the current range of PMMC instrument extended with the help of shunts ?
 - A 3ϕ , 500 V motor load has a pf of 0.4. Two watt meters connected to measure the input. They show the input to be 30 kW. Find the reading of each instrument.
 - Explain the difference between a CT and a PT.
 - An average reading digital multimeter reads 10 V when fed with a triangular wave, symmetric about the time axis. What will be the reading in a true rms voltmeter for the same input ?
 - What is the function of probe in CRO ? How many types of probes are used in CRO ?

P.T.O.

(j) Which of the following electronic instruments can be used to find the frequency component of a waveform and its higher harmonics ?

- (1) CRO, (2) Vacuum tube voltmeter, (3) Spectrum Analyzer and (4) Distortion factor meter.

2. (a) The ac bridge shown in Figure 1 below is used to measure the impedance Z. If the bridge is balanced for oscillator frequency $f = 2$ kHz, then find the value of the impedance Z. 5

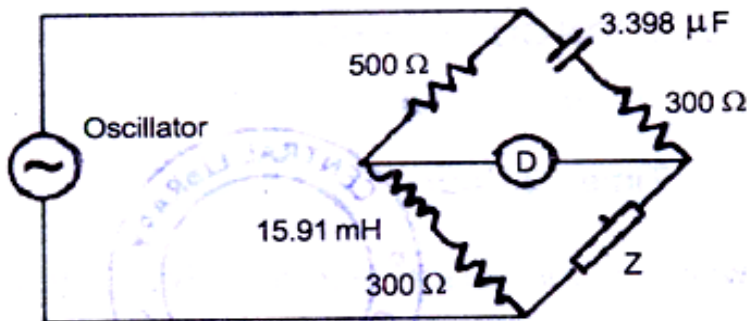


Figure 1

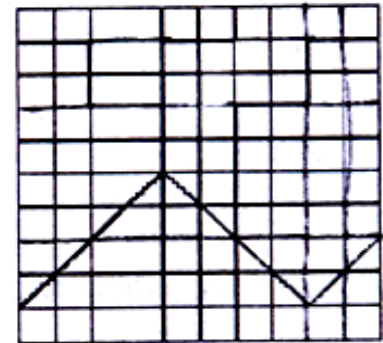


Figure 2

(b) The time/div and voltage/div axes of an oscilloscope have been erased. A student connects a 1 kHz, 5 V p-p square wave calibration pulse to channel-1 of the scope and observes the screen to be as shown in the upper trace of Figure 2. An unknown signal is connected to channel-2 (lower trace) of the scope. If the time/div and V/div on both channels are the same, then determine the amplitude (p-p) and period of the unknown signal. 5

3. (a) Show that the driving torque in a moving iron instrument is given by

$$T_D = \frac{1}{2} I^2 \frac{dL}{d\theta}, \text{ where the symbols have their usual meaning.} \quad 5$$

(b) Explain briefly how a potentiometer can be used (i) for calibration of a voltmeter, (ii) for calibration of a wattmeter. 5

4. Draw the circuit diagram of "Schering Bridge". Write the equations at balance and derive the expressions of the unknown parameters. Also draw the phasor diagram during balanced condition. Explain how the power factor and dissipation factor of a series unknown RC-circuit are calculated ? 10

5. (a) Describe in brief the construction and working principle of a single phase induction type energy meter. 5

- (b) What are the advantages and disadvantages if electro-dynamometer type of instruments ? 5
6. (a) Explain the principle of working of any digital voltmeter. 5
- (b) What is the requirement of "Screening of bridge components" ? Draw the circuit diagram of Wagner's earthing device and explain its operation. 5
7. (a) Draw the functional block diagram and explain the operation of heterodyne wave analyzer. How harmonic distortion of a signal is measured ? 5
- (b) Explain the measurement of frequency using electronic counter with a suitable block diagram. 5
8. Write short notes on any two of the following : 5×2
- (a) Q-meter
- (b) Measurement of Low Resistance by Kelvin's Double Bridge
- (c) Measurement of Flux and Magnetic Field by using Galvanometers
- (d) Electro Dynamometer type Ammeters and Voltmeters.

