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53 (IE 504) ELIN

2016

**ELECTRONIC INSTRUMENTATION**

Paper : IE 504

Full Marks : 100

Time : Three hours

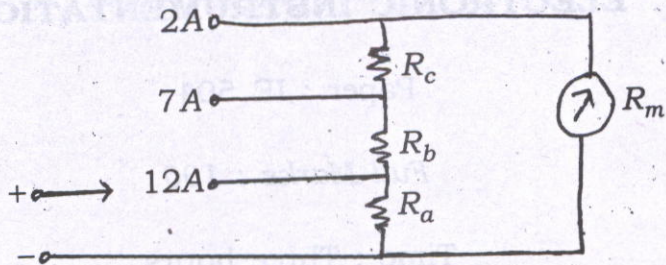
***The figures in the margin indicate full marks for the questions.***

***Answer any five questions.***

1. (a) With a neat block diagram explain the vector impedance meter. 10

Contd.

- (b) Design an Ayrton shunt to provide an ammeter with current ranges 2A, 7A, 12A. If coil resistance  $R_m = 50\Omega$  and FSD current 1mA is used for following configuration. 6



- (c) Differentiate between Dynamometer wattmeters and Induction wattmeters. 2

- (d) The accuracy of five digital voltmeters are checked by using each of them to measure a standard 1.0000V from a calibration instrument. The voltmeter readings are as follows :

$V_1 = 1.001V$ ,  $V_2 = 1.002$ ,  $V_3 = 0.999$ ,  
 $V_4 = 0.998$  and  $V_5 = 1.000$ . Calculate the average measured voltage and the average deviation. 2



2. (a) Name the elements present in electronic multimeter. Explain balanced-bridge *dc* amplifier using FETs. 8
- (b) Explain the block diagram of true *rms*-reading voltmeter. 5
- (c) Explain the inductance measuring meter using the phase shift characteristics. What is the phase shift of the circuit? 3
- (d) A PMMC instrument with a 100 turn coil has a magnetic flux density in its air gaps of 0.2T. The coil dimensions are  $D=1\text{ cm}$   $l=1.5\text{ cm}$ . Calculate the torque on the coil for a current of 1mA.
- (e) What is eddy current? 1
- (f) Damping force in PMMC is required for \_\_\_\_\_ . 1

3. (a) Explain Hartley Oscillator with the equivalent circuit showing the amplifier and feedback component. 6
- (b) What is pi attenuator? 2
- (c) What is Q meter? Explain basic Q meter circuit. For series Q meter derive the following : 8
- (i) Resistance of the unknown, if purely resistive
  - (ii) Inductance of the unknown
  - (iii) Q of the unknown coil.
- (d) The Q meter circuit is in resonance when supply voltage  $(E) = 230\text{mV}$ ,  $R = 3\Omega$  and  $X_L = X_C = 98\Omega$ . Calculate the coil Q and the voltmeter indication. 3
- (e) Sensitivity of a voltmeter with a bandwidth of 10Hz to 10MHz is \_\_\_\_\_ 1



4. (a) What is the frequency range for VHF spectrum analyzer ? Explain the block diagram of general-purpose spectrum analyzer. 6

(b) What are the frequency instabilities found in spectrum analyzer for narrow frequency ranges ? Explain. 4

(c) What is total harmonic distortion ? Explain tuned circuit harmonic analyzer. Also state its drawbacks. 1+3+2=6

(d) What is the role of impedance converter and rejection amplifier in fundamental-suppression distortion analyzer ? 4

5. (a) Explain following : 5×2=10

(i) Electrostatic focusing of CRT.

(ii) Vertical and Horizontal amplifier of oscilloscope.

(iii) Lumped parameter Delay line

- (iv) Distributed parameter Delay line
- (v) Uncompensated attenuator.
- (b) Name the controls associated with the operating voltages of the cathode ray tube and give their functions. 5
- (c) Show electrode voltages of CRT. 3
- (d) Draw and explain block diagram of the vertical section of an oscilloscope. 2
6. (a) Explain the following statements : 4+4=8
- (i) Same electron beam is used to generate two traces and deflected from vertical sources of oscilloscope.
- (ii) Hall effect sensor in the current probe provide frequency response to zero.
- (b) Give the function of following interface signal lines 2
- (i) NDAC
- (ii) EOI



- (c) Explain the simplified block diagram of the sampling circuitry. Give disadvantages of the storage cathode ray tube. 10

7. Write short notes on following : **(any four)**  
5×4=20

- (i) X-Y recorders
- (ii) Astable multivibrator
- (iii) Frequency synthesized signal generator
- (iv) Bistable storage tube
- (v) Storage CRT.