53 (IE 504) ELIN

2013

(May)

ELECTRONIC INSTRUMENTATION

Paper : IE 504

Full Marks : 100

Pass Marks : 30

Time : Three hours

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

*Answer **any five** questions.*

1. *(a)* What is the need of electronic instrumentation in advances of technology ? 4

   (b) State the components of a oscilloscope subsystem. Discuss in detail *any two* of them. 10

   (c) What are the ideal characteristics of an OP-AMP ? How we can get unity gain using IC 741 ? Define CMRR in case of OP-AMP. 6

2. *(a)* Discuss the operation of a Colpitt's oscillator. 8

(b) Discuss IEEE 488 Bus structure. 7

(c) A moving coil instrument has a resistance of 10Ω and gives full scale deflection, when carrying a current of $50mA$.
Show how it can be adopted to measure
(i) Currents upto $100A$
(ii) Voltage upto $750V$ 5

3. *(a)* What is PLL ? How PLL is used as a frequency synthesizer ? 10

(b) How operating ranges of DC ammeter and voltmeter can be increased ? 4

(c) Convert a basic D'Arsonval movement with an — internal resistance of 50Ω and a full scale deflection current of $2mA$ into a multirange d.c. voltmeter with voltage ranges of, $(0-10V)$, $(0-50V)$, $(0-100V)$. 6

4. *(a)* Discuss the construction and application of electro-dynamometer movement based instrument. Derive the expression for deflection and deflecting torque in case of this type of instruments. 8

(b) Discuss the principle of working, construction, and related torque equation for PMMC meters. 8

(c) Explain power measurement in 3-ϕ load. 4

5. (a) Define ground loop. How ground loop interference occurs and how it is reduced ? 8

(b) Explain how audio frequency can be generated ? 8

(c) Describe the operation of magnetic tape recorder. 4

6. (a) What is Q-meter ? State the principle of working of a Q-meter based upon $R-L-C$ circuit. 8

(b) Sketch a practical circuit diagram of a Q-meter. How we an measure inductance and effective resistance using Q-meter circuit ? 7

(c) A circuit consisting of a coil, a resistance and a variable capacitor connected in series is to be tuned to resonance using a Q meter. If the frequency is $500KHz$, the resistance $0 \cdot 5\Omega$ and the variable capacitor set to $350pF$ calculate the effective inductance and resistance of the coil, it Q meter indictes 90. 5

7. Write short notes on ***any two*** of the following : $10 \times 2 = 20$

(i) True RMS Responding voltmeter

(ii) Function Generator

(iii) Potentiometric Strip Chart Recorder

(iv) Input guarding to reduce ground loop interference.

(v) Hartley Oscillator.
