53 (IE-504) ELIN

2013

(December)

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)* How the overall efficiency of a coil and capacitor can be evaluated ? 3

   (b) Establish the mathematical relationship to measure the value of Q of a coil. 7

   (c) A circuit consisting of a coil, a resistance and a variable capacitor connected in series is to tuned to resonance using a Q meter. If the frequency is $500kHz$, the resistance 0.5Ω and the variable capacitor set to 350 *P.F.* calculate the effective inductance and resistance of the coil, if the Q meter indicates 90. 5

(d) Draw the practical circuit of a Q meter. How a capacitor value can be calculated using the circuit ? 3+2=5

2. (a) Draw an equivalent circuit of an oscillator, also determine how output impedance value can be calculated. 5

(b) What are the different A.C signal generators ? 3

(c) State and explain the selection criteria of oscillator. 6

(d) Draw and explain the basic Hartley oscillator circuit. 3

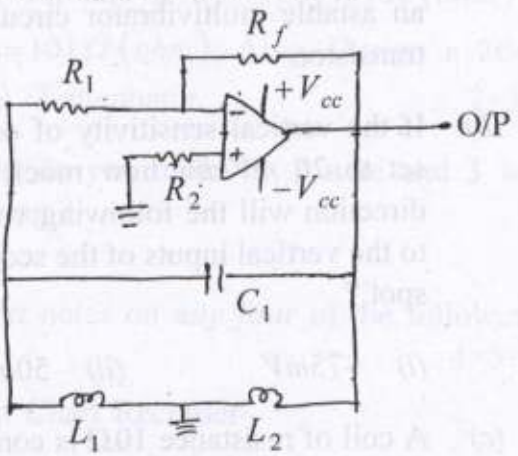
(e) State the two "Bark Hansen" criteria. 3

3. (a) Discuss with block diagram for an instrument that produce sine wave output whose frequency is automatically swept. 8

(b) What is the importance of offset null in *IC* 741 ? Define CMRR in case of OP-AMP. 2+3=5

(c) What is IEEE 488 bus ? What are its mode of applications ? 5+2=7

4. *(a)* Determine the value of L_2 and C_1 of the following oscillator circuit. 6



$L_1 = 10\,\mu H$ $\quad R_f = 405\,k\Omega$

$R_1 = 15\,k\Omega$ $\quad R_2 = 10\,k\Omega$

$L_1 = 10\,\mu H$ $\quad f_0 = 300.9\,kHz$

(b) What are the two resonance frequencies in case of crystal oscillator ? Also, draw the equivalent circuit for crystal oscillator. 4

(c) Draw a circuit diagram that is designed for generation of high frequency sinusoidal oscillation. (Range 10 *kHz* to 100 *MHz*). 4

(d) What is pulse generator ? What are the characteristics of ideal characteristic pulse wave ? Also draw the characteristic curve of actual pulse wave. 6

5. *(a)* How non sinusoidal waveform can be generated using astable multivibrator. Draw an astable multivibrator circuit using PNP transistor. 8

(b) If the vertical sensitivity of oscilloscope is set to 20 *mV/div*, how much and in what direction will the following voltage applied to the vertical inputs of the scope deflect the spot ?

(i) $-75mV$ *(ii)* $50mV$. 3

(c) A coil of resistance 10Ω is connected in the Q meter circuit. Resonance occurs at a frequency of $1MHz$ with the tuning capacitor set at $65PF$. Calculate the percentage of error introduced in the calculated value of Q if resistance of 0.02Ω is used across the oscillator circuit. 5

(d) Explain how audio frequency can be generated. 4

6. *(a)* Define ground loop. How ground loop interference occurs and how it is eliminated ? 7

(b) What are the components of a oscilloscope subsystem ? Discuss in detail about vertical deflection sub-system. 7

(c) In case of symmetrical T-attenuator, find R_0 and α for $R_1 = 409\,\Omega\,(ohm)$ & $R_2 = 101\Omega\,(ohm)$. Also, Design a $20dB$, 50Ω T-attenuator. 2+3=5

(d) What do you mean by 2 wire and 3 wire sensing ? 1

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

(i) Strip Chart Recorder

(ii) Electronic Analog A.C. Voltmeter

(iii) Electronic Analog ammeter

(iv) Four wire sensing

(v) PLL

(vi) Magnetic Recorders

(vii) Digital Voltmeter

(viii) Frequency Selective wave Analyzer

(ix) Electronic Instrumentation and Energy Conservation.
