

B.TECH/AEIE/6TH SEM/AEIE 3202/2018
ELECTRONIC INSTRUMENTATION AND MEASUREMENT
(AEIE 3202)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

*Candidates are required to give answer in their own words as far as
practicable.*

Group - A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) The typical forward current for LED to give reasonable brightness is
(a) 100mA (b) 20mA (c) 20μA (d) 300 μA .
 - (ii) In measurement made using a Q-meter, high impedance elements should preferably be connected in
(a) star (b) delta (c) series (d) parallel.
 - (iii) In spectrum analyzer the attenuation level of a given signal is expressed in
(a) volt (b) dB (c) amp (d) dB_m.
 - (iv) The combination of sampling and storage oscilloscope is called
(a) four traces CRO (b) dual traces CRO
(c) DSO (d) time base oscilloscope.
 - (v) Buffer amplifier is used in electronic circuit
(a) to amplify input signal (b) for impedance matching
(c) for noise elimination (d) to attenuate input signal.
 - (vi) In dual trace oscilloscope for measuring the low frequency signal, the best selected mode is
(a) alternate mode (b) chop mode
(c) x-y mode (d) sweep mode.
 - (vii) The accuracy of digital frequency meter is usually stated as
(a) ±1 LSD ± time base error (b) ±2 LSD ± time base error
(c) ±4 LSD ± time base error (d) ±3 LSD ± time base error.

- (viii) Charge amplifier is used in
(a) VCO (b) Hall effect transducer
(c) Piezoelectric transducer (d) Ramp type DVM.
- (ix) For the PLL chip NE565, the dual supply voltages V_{CC} and V_{EE} are 10V and -10V respectively. If the free running frequency of it is 10KHz, the upper lock frequency of it is
(a) 6 KHz (b) 12 KHz (c) 14KHz (d) 15 KHz.
- (x) A circuit which can be used to convert a sine waveform into a pulse waveform is
(a) non-inverting amplifier (b) inverting amplifier
(c) Schmitt Trigger (d) summing amplifier.

Group - B

2. (a) Draw the block diagram of PLL and explain its operation.
(b) What are lock range and capture range of PLL? Derive the expression for lock range of PLL.
- 5 + (2 + 5) = 12**
3. (a) Design a voltage to frequency converter circuit and show how the frequency is proportional to the input dc voltage. Mention one application and one commercially available chip for this.
(b) For a voltage to frequency converter, if V_{ref} = -10V, integrating capacitor and resistor are 0.1μF and 1MΩ respectively. What would be the output frequencies for input voltages 5V and 10V?

(2 + 5 + 2) + 3 = 12

Group - C

4. (a) How oscilloscope time base is designed by using sweep generator. Explain its operation.
(b) How can it be possible to measure the phase difference between two input sine wave signals having same frequencies and different frequencies by CRO?
- (3 + 4) + 5 = 12**
5. (a) Draw the block diagram of a delayed -Time-Base oscilloscope and show the waveforms at each stages of it.
(b) What is the purpose of blanking circuit in automatic time base of a CRO?

(3 + 5) + 4 = 12

Group – D

6. (a) A digital frequency meter is used to measure signal frequency of 100Hz. Calculate the percentage error for the measurement of this frequency. How is it possible to minimize the percentage error for the above case?
- (b) How time period and pulse width of a signal can be measured by digital frequency meter?

$$(4 + 5) + 3 = 12$$

- 7.(a) Explain the operation of successive approximation type digital voltmeter.
- (b) What is the operating principle of LCD? What are the advantages of LCD over LED-display?
For a 3½ –digit seven-segment LCD display determine the required supply current if current consumption per segment is 300μA.

$$4 + (3 + 2 + 3) = 12$$

Group – E

- 8.(a) With a neat block diagram explain the operation of a swept superheterodyne spectrum analyzer. What is RBW of spectrum analyzer?
- (b) A coil with a resistance of 10Ω is connected in the direct measurement mode of Q meter. Resonance occurs when the oscillator frequency is 1MHz and the resonating capacitor is set at 65pF. Calculate the % error introduced in measurement of Q value by 0.02Ω insertion resistance.

$$(6 + 1) + 5 = 12$$

9. (a) What is virtual instrumentation? Draw the architecture of a virtual instrumentation system and explain the purpose of different modules of it.
- (b) What is signal to noise ratio? What are the different types of noises?

$$(2 + 2 + 5) + (1 + 2) = 12$$