

B.E DEGREE EXAMINATIONS: APRIL/MAY 2012

Fourth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

ECE109: Measurements and Instrumentation

Time: Three Hours

Maximum Marks: 100

Answer ALL Questions:-

PART A (10 x 1 =10 Marks)

1. The coulomb's experimentally derived law for the force between two electric charges is
A. $F = Q^2 / r^2$ B. $F = (k.Q_1Q_2)/ r^2$ C. $F = Q / t$ D. $F = Q / r$
2. Which bridge is suited for the measurement of high-Q inductors?
A. Wheatstone bridge B. Maxwell bridge C. Anderson bridge D. Hay bridge
3. In Q-meter, the reactance $X_s = (c_1 - c_2) / \omega c_1 c_2$ will be capacitive if
A. $c_1 > c_2$ B. $c_1 < c_2$ C. $c_1 = c_2$ D. $c_1 \geq c_2$
4. The typical resolution for the 8 bit A/D conversion is
A. 1/8 B. 1/16 C. 1/24 D. 1/32
5. The desired frequency (f_v) for the VCO in a frequency synthesizer is
A. N / f_r B. N^2 / f_r C. $N f_r$ D. $(N + 1) f_r$
6. The dynamic range of a spectrum analyzer with a 3rd order intercept point of +25 dBm and a noise level of -85 dBm is
A. 83 dB B. 73 dB C. 103 dB D. 93 dB
7. The output voltage (V_{out}) from the integrator in an integrating DVM is
A. $(-V_x t) / RC$ B. $(-V_x RC) / t$ C. $(-V_x R) / t$ D. $(V_x RC) / t$
8. One of the very common instrumental error which occurs whenever period and frequency measurements are made is the
A. Time-base error B. Trigger level error C. Gating error D. Frequency level error
9. The input impedance of an instrumentation amplifier is
A. Very low B. Very high C. Low D. High
10. What is the numerical aperture of a fiber with the refractive indices of the core and cladding as 1.47 and 1.45 respectively?
A. 0.242 B. 0.024 C. 1.242 D. 0.042

PART B (10 x 2 =20 Marks)

11. Define accuracy and precision with regard to measurements.

12. Define standards in measurement and list the types of standards in measurement.
13. List the elements belonging to an electronic multimeter.
14. What are the merits of storage oscilloscope over the conventional (non-storage) oscilloscope?
15. State the purpose of a wave analyzer with its basic circuit configuration.
16. Define harmonic distortion and total harmonic distortion.
17. Give the basic principle of a simple frequency counter.
18. Define time-base error and trigger-level error with its importance.
19. State the use of IEEE 488 electrical interface and the logic levels of IEEE 488 bus.
20. Justify why multiplexing is necessary and mention the two ways of accomplishing multiplexing in DAC.

PART C (5 x 14 =70 Marks)

21. a) (i) Explain the Permanent Magnet Moving Coil (PMMC) mechanism with details of instrument bearings. (7)
- (ii) Discuss the operation of true r.m.s-reading voltmeter with its block diagram. (7)

(OR)

- b) (i) Discuss the working principle of wheat stone bridge and determine the balancing condition of wheat stone bridge? (7)
- (ii) With the schematic diagram of Maxwell bridge, describe its working and the balancing condition procedure of the bridge. (7)

22. a) Explain the working principle of a CRO with its block diagram and discuss the internal structure of a CRT.

(OR)

- b) Describe a basic Q-meter circuit working principle and explain the direct, series and parallel measurement methods for connecting unknown components to the test terminals of a Q-meter.

23. a) (i) Using block diagram, illustrate the importance of sweep-frequency generator. (7)
- (ii) Describe the basic elements of a function generator with their purpose. (7)

(OR)

- b) With the block diagram of a general purpose spectrum analyzer, illustrate its functions.

24. a) Describe the characteristics of a Digital Voltmeter (DVM) and explain Ramp type DVM and Successive-Approximation DVM with suitable block diagrams.

(OR)

b) (i) Explain the basic function of the frequency synthesizer circuit. (7)

(ii) Illustrate how the automatic heterodyning unit can be used for extending the frequency range in the frequency counters. (7)

25. a) (i) Enumerate the elements of a digital data acquisition system with the functioning of each element used. (7)

(ii) Discuss on how the computer-controlled measurement system can be used for testing an audio amplifier. (7)

(OR)

b) (i) With the block diagram of an optical power meter, describe its role in fiber optic power measurements. (7)

(ii) With the block diagram of an Optical Time Domains Reflectometer (OTDR), discuss its significance in fiber optic measurements. (7)
