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T 8156

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Fourth Semester

Electronics and Communication Engineering

EC 1255 — MEASUREMENTS AND INSTRUMENTATION

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Precision is a necessary but not sufficient condition for accuracy. True or False – justify your answer.
2. What are the two conditions to be satisfied to make an AC bridge balanced?
3. What is a vector voltmeter?
4. Justify – 'A CRO can be regarded as a X - Y recorder'.
5. What are the requirements of signal generator?
6. What is real time spectrum analyser?
7. Enumerate the advantages of digital meter over the analog meters.
8. Why is period mode preferred for measurement of very low frequency in a frequency counter?
9. What is meant by IEEE 488 standard and GPIB?
10. What are the various instruments used in computer controlled instrumentation system?

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PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the types of errors possible in an instrument and also discuss their causes and remedies. (10)
- (ii) A resistance is measured by voltmeter ammeter method. Ammeter shows 3.22 A on a 10 A scale and the voltmeter shows 96.6 V on 300 V range. Both ammeter and voltmeter are guaranteed to be accurate within $\pm 0.5\%$ of full scale regarding. Find the indicated value of resistance and the limiting error within which you can guarantee the result. (6)

Or

- (b) (i) Explain, how Schering bridge is used for the measurement of unknown capacitor. Derive its balance equation. (12)
- (ii) Explain, how the quality factor can be obtained using Schering bridge? (4)
12. (a) (i) Draw and explain the block diagram of digital storage oscilloscope and the modes of operation of digital storage oscilloscope. (10)
- (ii) What are Lissajous patterns? How are they used for frequency measurement? (6)

Or

- (b) (i) Explain, how the Q - meter can be used for the measurement of Q factor and Effective Resistance and discuss the sources of error. (10)
- (ii) A coil with a resistance of 10Ω is connected in the direct measurement mode. Resonance occurs when the oscillation frequency is 1.0 MHz and the resonating capacitor is set at 65 PF. Calculate the % error introduced in the calculated value of Q by the 0.02Ω insertion resistance. (6)
13. (a) (i) Draw and explain the block diagram of sweep generator covering entire frequency band. (12)
- (ii) What is marker generator? How does it overcome the disadvantages of a sweep generator? (4)

Or

- (b) (i) With a neat diagram, describe the operation of a superhetrodyne spectrum analyser. (12)
- (ii) What is the dynamic range of a spectrum analyser with a third order intercept point of +25 db and a noise level of - 85 db? (4)

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14. (a) (i) With a neat schematic, explain the operation of a dual slope analog to digital conversion. (10)
- (ii) A dual slope ADC uses a 16 bit counter and 4 MHz clock rate. The maximum input voltage is + 10 V. The maximum integrator output voltage should be -8 V when the counter has cycled through 2^n counts. The capacitor used in the integrator is $0.1 \mu\text{F}$. Find the value of the resistor R of the integrator. (6)

Or

- (b) (i) With a block schematic, explain the 'frequency mode' and the 'frequency ratio' mode operation of a frequency counter. (12)
- (ii) What is meant by gating error in a frequency counter? How does it arise? Can it be eliminated? (4)
15. (a) (i) Explain the generalised block schematic of a Digital Data Acquisition system and list out its advantages over analog Data Acquisition system. (8)
- (ii) What are the various techniques of multiplexing? Discuss any one in detail? (8)

Or

- (b) (i) Draw the schematic diagram of a computer-controlled measurement system for testing a radio receiver using an automatic system.
- (ii) Explain the various management lines and data byte transfer lines of GPIB.

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