

ELECTRICAL ENGINEERING DEPARTMENT

EEL790: Optoelectronic Instrum: Major Test: Novemeher 2006: Time 2 hrs: 50 Marks

Attempt all questions. Please be brief and to the point.

Q.1(a) An ammeter with an internal resistance of 100Ω is used to measure the current in a $2k\Omega$ resistor connected to a $10V$ supply voltage. Determine the percentage error in the measurement?

(b) The signal $m(t) = 10 \cos(60\pi t) + \cos^2(160\pi t)$ is sampled at the rate of 400 samples per second. Draw the spectrum of sampled signal. Further, if the sampled signal is passed through an ideal LPF of cut-off frequency 100Hz , what will be filter output? (5+5)

Q.2(a) A sinusoidal source with 50Ω internal resistance is supplying 0.18W power to a 50Ω load resistance. If the load resistance is replaced by another load resistance of 75Ω , what will be the power delivered (in dBm) by the source?

(b) Draw the circuit diagram of Instrumentation Amplifier using opamps. Find out its output voltage in terms of the input voltages. (5+5)

Q.3(a) Explain the working of fiber-optic gyroscope sensor.

(b) A fiber-optic gyroscope has a circular coil of diameter 12cm . The total length of the fiber used in the coil is 400m . If it is operating at $\lambda = 0.633\mu\text{m}$, what is the phase shift in radians corresponding to the angular speed of $5 \times 10^{-4} \text{ rad/s}$?

(c) Show that for a fiber Bragg grating sensor ($\lambda_B = 2n_{\text{eff}}\Lambda$), shift in λ_B with pressure (change Λ) is given by

- Q.4 (a) What is an arbitrary waveform generator (AWG)? Give its block diagram and explain the working.
- (b) What are the advantages of digital filter over the analog filters? Give the classification of digital filters on the basis of impulse response and realization.
- (c) Give the various kinds of signals and the corresponding number of pins used in GPIB. How many different devices can be connected to a GPIB and what is the maximum permissible distance?
- (d) What do you understand by line drivers and line receivers used with the RS-232C interface? To make two PCs communicate through USB ports, what needs to be done/used?
- (e) What components are normally put together for the microcontroller into a given chip? Give the names and the manufacturer of the most widely used 8-bit microcontroller

(5×4)
