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RF-3579-80

M. Sc. (Part-II) Examination

April / May – 2010

Physics : Paper - II

(Electronics - I) (Spl. Electronics)
(Electronics Communication &
Measurement & Instrumentation)

Time : **3** Hours] [Total Marks : **70**

RF-3579

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :
☛ **M. Sc. (Part-2)**

Name of the Subject :
☛ **Physics - 2**

☛Subject Code No. : **3 5 7 9** ☛Section No. (1, 2,.....) : **1**

Seat No. :

Student's Signature

(2) Answer to the two sections must be written in separate answer books.

(3) Symbols have their usual meaning.

(4) Figures to the right indicate full marks of the question.

1 (a) Define white noise and derive the expression for rms noise voltage. 2

(b) Show that if the PSD and the power of a signal v(t) are G:(f) and P_i respectively then the PSD and the power of the signal aV(t) are $a^2G_i(f)$ and a^2P_i respectively. 3

(c) What is VSB? Why it is used for commercial television broadcasting? 3

(d) A receiver is connected to an antena whose resistance is $50\,\Omega$ has an equivalent noise resistance of $30\,\Omega$. Calculate the receiver's noise figure in dB and its equivalent noise temperature.

2 (a) Explain how Adaptive delta modulation improves the system's tolerance to slope overload. 5

(b) Define cumulative distribution function and show that it is a non-decreasing function. 2

(c) A 20 MHz, 5V carrier is modulated by a 500 H_2 sinusoidal wave. The maximum frequency deviation is 15 kHz and the same modulation index is obtained for both PM and FM. Write the expression for this modulated wave for (i) FM and (ii) PM. Next if the modulating frequency is increased to 3 kHz, keeping other parameters same, write new expression for F.M. and P.M.

OR

2 (a) Draw the block diagram of stereophonic broadcasting transmitter and receiver system and explain its working in brief. 4

(b) A signal $m(t) = \cos w_m t$ is modulated by $V_c(t) = A \cos w_c t$ 3
Describe the technique for recovery of the signal $m(t)$ from the received signal $S_i(t)$ by using squaring synchronizer.

(c) Consider the probability density $p(x) = a e^{-b|x|}$ where x is a random variable whose allowable values range from $x = -\infty$ to $x = \infty$. Find, 5
(i) the cumulative distribution function. (ii) the relation between a and b (iii) the probability that the outcome x lies between 1 and 2

3 (a) Draw the block diagram of DPSK transmitter and receiver system and explain the working of DPSK scheme. 6

(b) Explain the terms : 1
(i) Natural PAM sampling and (ii) Flat-topped PAM sampling.

(c) The wave form $V(t) = e^{-t/\tau} \cdot u(t)$ is passed through a high pass RC circuit having time constant equal to τ. Find the energy spectral density at the output of the circuit. 5

OR

3 (a) Consider a signal varying between peak values $\pm m_p$. 2
It is fed to a uniform quentizer to divide it into M uniform intervals. If the quantization error is uniformly distributed, show that, $N_q = \dfrac{m_p^2}{3m^2}$

(b) Derive the rader range equation. 5

(c) Determine the PSD of the following signal $v(t)$. 5

$$v(t) = \frac{1}{2} + \frac{2}{\pi} \sum_{n=1,2,3}^{w} \frac{(-1)^{(n-1)/2}}{n} \cdot \cos nt$$

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Name of the Examination :

☛ **M. Sc. (Part-2)**

Name of the Subject :

☛ **Physics - 2**

☛ Subject Code No. : **3 5 8 0** ☛ Section No. (1, 2,.....) : **2**

Seat No. :

Student's Signature

(2) Answer to the two sections must be written in separate answer books.

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(4) Figures to the right indicate full marks of the question.

4	(a)	Briefly explain the principle of Hall effect	3
	(b)	Define reproducibility and resolution of a measurement instrument.	3
	(c)	State sampling theorem and briefly explain aliasing effect.	3
	(d)	Compare spontaneous and stimulated emission.	2
5	(a)	Explain with schematic diagram, the working of digital as well as analog displacement transducers that can measure a linear displacement.	6
	(b)	A thermometer has time constant of 10 sec. and behaves as a first order system. It is initially at a temperature 30°C and then suddenly subjected to a surrounding temperature of 120°C. Calculate the 98% rise time and the time to attain 99% of steady-state temperature.	6

OR

5	(a)	Explain construction and working of,	6
		(i) Piezoelectric transducer and	3
		(ii) Resistance strain gauge.	3
	(b)	A resistance strain gauge with R = 150 ohm and F = 2 is placed in an equal arm bridge in which all the resistors are of 150 ohms. The power voltage is 6.0 Volt. Calculate the detector current in microampere per micro inch of strain. (Assume galvano meter resistance = 100 ohm).	6

6 (a) Explain the working of 8-bit SAR analog to digital converte with schemit diagram. 6

(b) An average photo generated current of $100\ \mu A$ in a reverse biased photo diode is measured using a series resistance of $10\ k\Omega$ and an amplifier with a band width of 100 kHz. 6

(i) Compare the relative contributions of Johnson and Shot noise voltage.

(ii) What is the signal-to-noise ratio at the amplifier output?

(Assume noise figure is 1 and the temperature is 293°K.)

OR

6 (a) With energy level diagrams explain the operation of the carbon dioxide laser. 6

(b) What are the sources of noise in experiment? For the flow of mionority charge curriers through p-n juction diode, show that the rms short noise current is $I_{rms} = \left[2\ q\ I_0\ \Delta f\right]^{1/2}$. 6