Registration No. :

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Fifth Semester Regular Examination – 2014

COMMUNICATION SYSTEM ENGINEERING

BRANCH(S) : AEIE, BIOMED, IEE

QUESTION CODE : H 147

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions :   2 ×10

    (a) Can you apply Dirichlet's conditions to a unit step function ? Justify.

    (b) What is a linear time invariant channel ? Give an example.

    (c) What is Gaussian in an additive noise model for a channel ?

    (d) What is a special feature of the spectrum of an impulse train of period T seconds ?

    (e) Give the spectrum of a signal defined as $x(t) = 10 \sin c(100t)$.

    (f) What is a line spectrum ? When do you obtain it ?

    (g) Write down an expression for an SSBSC signal. Show the changes that you need when you opt for the other sideband.

    (h) State the advantages of an envelope detector.

    (i) What is the frequency band for commercial FM broadcasting ? State the band similarly for AM broadcast.

    (j) What is a mixer ? Is it essential ?

2. (a) Explain the operation of a chopper type of AM modulator with the help of a neat sketch (s) and appropriate expressions.   5

(b) Evaluate the modulation index in an AM wave when the modulating signal is a $m(t) = \sin 100\pi t + 0.8\cos 250\pi t + 0.45\sin 300\pi t$ and a carrier given as $1.2\sin 2000\pi t$. Derive the formula used. 5

3. (a) Suggest a suitable method for detecting a VSB modulated signal. What is the practical application of such a signal ? 5

   (b) Derive the spectrum of a Gaussian pulse. Comment upon your result. · 5

4. (a) Evaluate $\int\limits_{-\infty}^{\infty} \operatorname{sinc}^2(t)\,dt$. 5

   (b) Find out the spectrum of a signal given as $m(t) = x(t)\dfrac{dx(t)}{dt}$. 5

5. (a) Discuss a ratio detector circuit with the help of a neat sketch, appropriate expressions and diagarms. 5

   (b) Prove that a PLL is performs the task of a time domain differentiator. 5

6. (a) Find out the instantaneous frequency in an FM signal when the carrier is and the modulating signal is a square wave of period 4 seconds with an amplitude of ± 3 V. Sketch it. Hence compute the maximum frequency deviation. Take $k_f = 20$ rad/V. 5

   (b) Compare the bandwidth requirements of an FM and a PM signal for the same modulating signal given as $10\sin 200\pi t$. 5

7. (a) Derive an expression for the quantization error power. What are your assumptions here ? 3+2

   (b) Suggest a scheme to perform companding. 5

8. Write short notes on any **two** : 5×2

   (a) Delta modulation

   (b) Coherent detector

   (c) Reactance modulator

   (d) Frequency translation.

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