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Daffodil International University

Department of Electrical and Electronic Engineering

Faculty of Engineering

Midterm Examination, Summer-2026

Course Code: 0714-311	Course Title: Communication Engineering	
Section: A,B,C,D,E	Level-Term: L3-T1	Teacher's Initial: FHT, AB
Full Marks: 25	Exam Date: July 4, 2026	Time: 1.5 Hours

Answer all Questions

[The second right most column indicates the course outcomes with respective Bloom's level and right most column indicates the allocated marks]

Q1.	(a) **Describe** a general communication system with a neat block diagram. **Explain** the function of each block in detail.	CO-1 C(2)	3
	(b) **Discuss** the major challenges faced in communication systems.	CO-1 C(2)	2
Q2.	(a) **State** Shannon's channel theorem in a noisy channel.	CO-1 C(1)	1
	(b) A receiver front-end consists of two cascaded amplifiers, amplifier 1 (A1) and Amplifier 2 (A2). The input signal power fed into the first stage is 5μW and the accompanying input noise power from the source antenna is 40nW.	CO-1 C(3)	2.5+ 2.5
	Amplifier 1 is an ideal amplifier which is placed first with a power gain of 13dB and Amplifier 2 is a non-ideal amplifier with a power gain of 20dB and an internal noise power of 360 nW (referred to its own input). **Determine** the following (i)Input and Output SNR of each amplifier (ii)Noise factor and noise figure of each amplifier.		
Q3.	A baseband message signal is given by $m(t) = \cos 50\omega_m t$ and the radio-frequency carrier signal is given by $c(t) = \cos 1000\omega_c t$, where $\omega_c > \omega_m$.	CO-2 C(3)	3+3
	(a) Using a multiplier modulator, derive the mathematical expression for the generated DSB-SC signal, s(t). Sketch the frequency spectrum of (i) original message signal, m(t). (ii) The generated DSB-SC signal, highlighting USB and LSB.		
	(b) Further, using a coherent demodulator, derive the expression for the recovered signal and explain the demodulation process. Also sketch the frequency spectrum of the (i) combined signal before it passes through the appropriate filter (ii) the final spectrum after filtering.		
Q4.	**Explain** the working of a non-linear DSB-SC modulator operating as a single balanced modulator. **Derive** the output expression and illustrate the frequency spectrum of the generated DSB-SC wave with suitable diagrams. Also state why the modulator is referred to as a single balanced modulator.	CO-2 C(3)	5

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Q5. **Sketch** the AM signal $[A+m(t)]\cos(\omega_c t)$ for the periodic triangular modulating signal m(t) shown in the Fig.1, corresponding to the following modulation indices: CO-2 C(3) 3

(ii) $\mu=0.5$

(ii) $\mu=1$

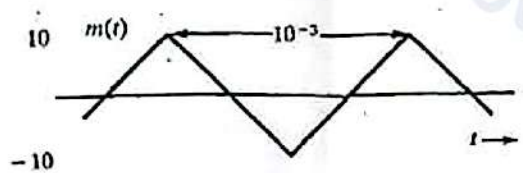


Fig.1