UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013

COURSE NAME	:	ELECTRONIC COMMUNICATION SYSTEM / COMMUNICATION ENGINEERING
COURSE CODE	:	BEB31803 / BEX31403
PROGRAMME	:	BEE / BEF / BED / BEH / BEU
EXAMINATION DATE	:	JUNE 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1 (a) Illustrate a general block diagram of the communication systems, and then explain briefly the function for the **THREE (3)** basic blocks.

(5 marks)

(b) By referring to Table Q1, explain the relationship between dB and power ratio.

(4 marks)

(c) A four stage system comprising of two loss stages and two gain stages which is arranged alternately as shown in Figure Q1. The first stage has a gain factor of 10 while the third stage is 10 times greater than the first one. The second and final stages have attenuation factor of 0.25 and -26.94 dB respectively. Given that the input voltage to the first stage is 10 mV.

(i) Determine the final output voltage, V_{out} of the system.

(ii) Determine the output power, P_{out} in dBm if a 10 kΩ load resistor is connected to the final stage.

(iii) If Stage 3 is a voltage divider network, design the network so that the final output voltage is increased to 1 V. Given that, one of the resistor values is fixed to 2.2 kΩ.

(16 marks)

Q2 (a) Define the term frequency modulation (FM). State three differences between FM and phase modulation (PM).

(8 marks)

(b) Given an FM wave as, V_{FM} (t) = 10 sin $(200\pi \times 10^6 t + 6cos8\pi \times 10^3 t)$ volts. From the experimental works of the circuit, the output frequency is proportionally increases with the increase of the input voltage, as tabulated in Table Q2. Hence, the frequency deviation constant, K_f (unit in Hz/V) can be determined. Determine:

(i) K_f,
(ii) the modulation index, carrier frequency and modulating frequency,
(iii) an expression of the information signal $V_m(t)$,
(iv) the bandwidth using Bessel Function (Table Q2(b)) and Carson's rule,
(v) the dissipated power if the above signal is delivered through a 75 Ω load, and
(vi) the frequency spectrum. Sketch and label it.

(17 marks)

Q3 (a) Define frequency deviation for Frequency Shift Keying (FSK). Then, illustrates and express it in mathematical equation.

(6 marks)

(b) Figure Q3 shows Quadrature Phase Shift Keying (QPSK) modulator. Construct the truth table, and constellation diagram.

(13 marks)

(c) Compare the bandwidth and noise performance for Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), and Phase Shift Keying (PSK).

(6 marks)

Q4 (a) Discuss the influence of temperature on thermal noise.

(5 marks)

(b) Noise power can be modeled using a Thevenin equivalent circuit. For an electronic device operating at a temperature of 27° C, with a bandwidth of 10 MHz and a 100 Ω load resistor, determine:

(i) the thermal noise power in dBW,
(ii) the signal to noise ratio (SNR) in dB if the signal voltage is 10 V, and
(iii) the noise voltage if there is an additional resistor connected in parallel to the existing one. Assume R2 = 75 Ω.

(13 marks)

(c) A three stages (A, B, and C) cascaded amplifier for a radio system is shown in Figure Q4. In order to minimize the effect of noise, a suitable configuration for the cascaded system needs to be identified. In your opinion, which one of these amplifiers should be placed at the first stage? Explain your answer.

(7 marks)

Q5 (a) A transmission line is a metallic conductor system used to transfer electrical energy from a point to another in the form of current flow.

(i) Describe unbalanced transmission lines.
(ii) Give an example of unbalanced transmission line.
(iii) Write the advantage and disadvantage of using the line.
(iv) Propose a method to connect a balanced transmission line to an unbalanced load.

(15 marks)

(b) Given the characteristic of a transmission line is 75 Ω. Its complex load impedance is given by 25 - j25 Ω.

(i) Determine the normalized input impedance and VSWR.

(ii) Evaluate the distance of a quarter-wave transformer if it is going to be placed from the load to match transmission line.

(iii) Determine and characteristic impedance of the quarter-wave transformer.

You must use Figure Q5 to locate all answers.

(10 marks)

Q6 (a) In a table form, compare the local area network (LAN) and wide area network (WAN) in terms of

(i) speed,
(ii) application technologies, and
(iii) maintenance costs.

(6 marks)

(b) As a communication engineer, discuss what are the two most significant limitations contribute to the performance in a communication systems.

(8 marks)

(c) You have been hired as a leader to consult a new company that want to setup their network in the new office in Iskandar Malaysia, Johor Bahru. What types of communication technology will you recommended them with concrete reasons to support your idea. You also can specify the dimension of the office and how many employees that are working in that company.

(8 marks)

(d) From your point of view, can wired and wireless technology be integrated? Give an example and discuss ONE (1) advantage.
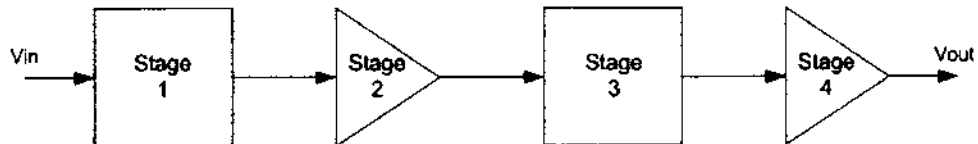
(3 marks)

- END OF QUESTION -

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TABLE Q1

dB	Power ratio
-3	0.501
-2	0.631
-1	0.794
0	1
1	1.259
2	1.585
3	1.995

FIGURE Q1

TABLE Q2

Voltage (V)	0.25	0.50	0.75	1.0	1.25
Frequency (kHz)	1.0	2.0	3.0	4.0	5.0

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TABLE Q2(b)

m	Carrier J_0	J_1	J_2	J_3	J_4	J_5	J_6	J_7	J_8	J_9	J_{10}	J_{11}	J_{12}	J_{13}	J_{14}	J_{15}	J_{16}
0.0	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.3	0.98	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.5	0.94	0.24	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.0	0.77	0.44	0.11	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-
1.5	0.51	0.56	0.23	0.06	0.01	-	-	-	-	-	-	-	-	-	-	-	-
2.0	0.22	0.58	0.35	0.13	0.03	-	-	-	-	-	-	-	-	-	-	-	-
2.5	-0.05	0.50	0.45	0.22	0.07	0.02	-	-	-	-	-	-	-	-	-	-	-
3.0	-0.26	0.34	0.49	0.31	0.13	0.04	0.01	-	-	-	-	-	-	-	-	-	-
4.0	-0.40	-0.07	0.36	0.43	0.28	0.13	0.05	0.02	-	-	-	-	-	-	-	-	-
5.0	-0.18	-0.33	0.05	0.36	0.39	0.26	0.13	0.06	0.02	-	-	-	-	-	-	-	-
6.0	0.15	-0.28	-0.24	0.11	0.36	0.36	0.25	0.13	0.06	0.02	-	-	-	-	-	-	-
7.0	0.30	0.00	-0.30	-0.17	0.16	0.35	0.34	0.23	0.13	0.06	0.02	-	-	-	-	-	-
8.0	0.17	0.23	-0.11	-0.29	-0.10	0.19	0.34	0.32	0.22	0.13	0.06	0.03	-	-	-	-	-
9.0	-0.09	0.24	0.14	-.018	-0.27	-0.06	0.20	0.33	0.30	0.21	0.12	0.06	0.03	0.01	-	-	-
10.0	-0.25	0.04	0.25	0.06	-0.22	-0.23	-0.01	0.22	0.31	0.29	0.20	0.12	0.06	0.03	0.01	-	-
12.0	-0.05	-0.22	-0.08	0.20	0.18	-0.07	-0.24	-0.17	0.05	0.23	0.30	0.27	0.20	0.12	0.07	0.03	0.01
15.0	-0.01	0.21	0.04	0.19	-0.12	0.13	0.21	0.03	-0.17	-0.22	-0.09	0.10	0.24	0.28	0.25	0.18	0.12
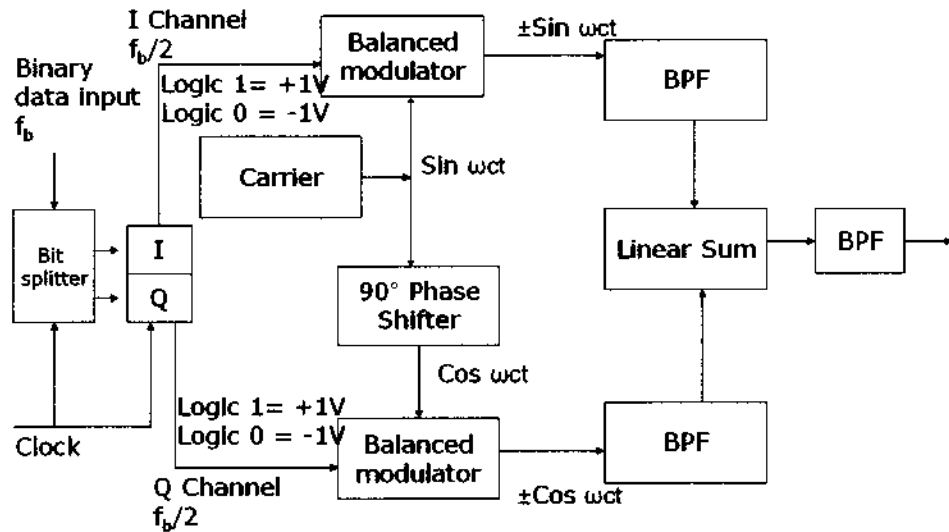
FIGURE Q3

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S_i → [G=10 dB T_e= 200 K] A → [G=30 dB F= 10 dB] B → [G=100 F=2 dB] C → SNR_o

FIGURE Q4

Smith Chart

RESISTANCE COMPONENT (R/Zo), OR CONDUCTANCE COMPONENT (G/Yo)
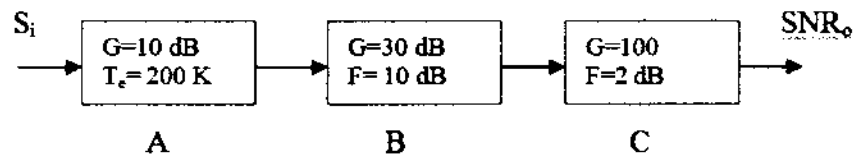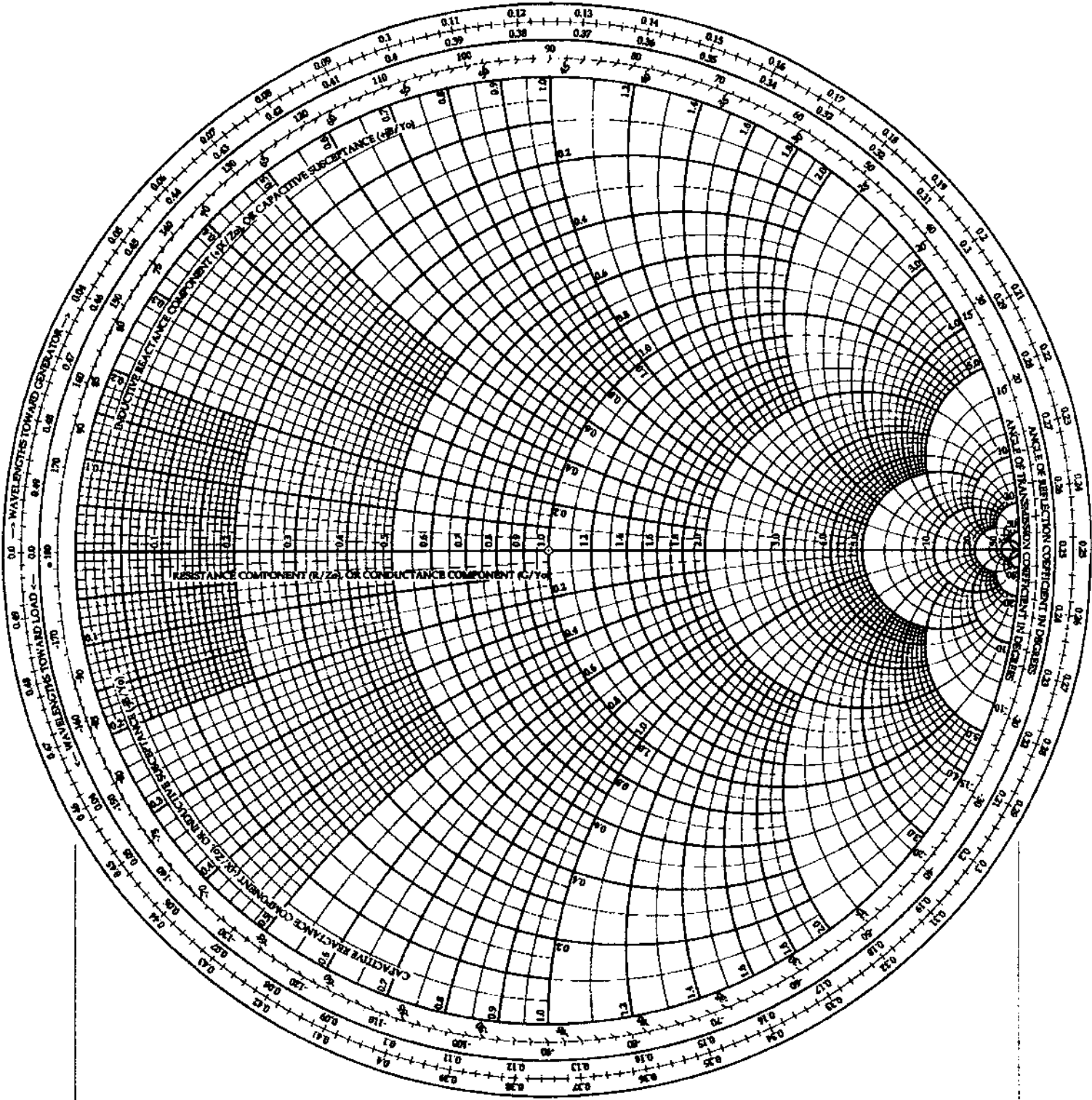
RADIALLY SCALED PARAMETERS

TOWARD LOAD → ← TOWARD GENERATOR

CENTER

ORIGIN