



**M.E DEGREE EXAMINATIONS: JUNE 2018**

(Regulation 2015)

Second Semester

**COMMUNICATION SYSTEMS**

P15COTE14: RF System Design

**COURSE OUTCOMES**

**CO1:** Describe the various passive and active components for radio frequency circuits

**CO2:** Analyze micro strip line filters

**CO3:** Analyze the biasing methods for RF amplifiers

**CO4:** Compare the various RF oscillators for their performance

**CO5:** Design matching networks using smith charts

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-  
PART A (10 x 1 = 10 Marks)**

1. Assertion (A):The receiver is a RF system CO1 [K<sub>2</sub>]  
Reason (R):Since it has a modulator and amplifier
  - a) Both A and R are Individually true and R is the correct explanation of A
  - b) Both A and R are Individually true but R is not the correct explanation of A
  - c) A is true but R is false
  - d) A is false but R is true
2. The frequency range of high frequency is CO1 [K<sub>2</sub>]
  - a) 300-3000 Mhz
  - b) 3000-30000Mhz
  - c) 30-300 Mhz
  - d) 3-30 Mhz
3. RF filter Design uses CO2 [K<sub>2</sub>]
  - a) Kuroda s identity
  - b) Kuroka s identity
  - c) Karoda s identity
  - d) Kuruku s identity
4. Match list I with List II and select the correct answer using the codes given below in the list CO2 [K<sub>3</sub>]

List I	List II
A .Insertion loss IL	i. RF filter
B. Shape factor	ii. elliptic filter
C. ripples in the stop and pass bands	iii. $BW^{60dB} / BW^{3dB}$
D. Resonant filter	iv. $\log P_{in} / P_L$

	A	B	C	D
a)	i	ii	iii	iv
b)	iii	iv	i	ii
c)	vi	iii	ii	i
d)	i	iv	iii	ii

5. Assertion (A): Schottky diode is 2 terminal Semiconductor device CO1 [K<sub>3</sub>]  
Reason (R): Therefore it can work similar to PN junction diode without any performance improvement in its operation
- a) Both A and R are Individually true and R is the correct explanation of A      b) Both A and R are Individually true but R is not the correct explanation of A  
c) A is true but R is false      d) A is false but R is true
6. HEMT is a CO1 [K<sub>2</sub>]
- a) High electron mobility transistor      b) Heavier electron mobility transistor  
c) High electrical mobility transistor      d) High energy mobility transistor
7. In amplifier design consideration have to be given to CO3 [K<sub>2</sub>]  
1. Stability  
2. VSWR.  
3. Shape of the circuit.  
4. Elegance of the circuit.
- a) 1,3      b) 1,4  
c) 1,2      d) 2,3
8. The name of chart used in the design of RF amplifier is CO5 [K<sub>2</sub>]
- a) Polar chart      b) Linear chart  
c) Smith chart      d) logarithmic chart
9. Mixer is used in a receiver CO4 [K<sub>2</sub>]
- a) To mix local oscillator output and RF amplifier output      b) To mix Detector output and RF amplifier output  
c) To mix RF amplifier output and audio amplifier output      d) To mix modulator output and RF amplifier output
10. The following are various circuits from antenna to LP filter in a heterodyne receiver system incorporating a mixer. CO4 [K<sub>2</sub>]  
1. LNA, 2. Detector, 3. Combiner, 4. LP filter, 5. antenna  
The correct sequence from antenna to LP filter is
- a) 1-3-5-4-2      b) 5-1-3-2-4  
c) 2-4-5-3-1      d) 1-3-4-1-2

**PART B (10 x 2 = 20 Marks)**

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|---|-----|-------------------|
| 11. Compare single plate chip capacitor and dual chip capacitor.  | CO1 | [K <sub>2</sub> ] |
| 12. Distinguish between RF circuits and low frequency circuits.   | CO1 | [K <sub>2</sub> ] |
| 13. Summarize the design parameters of filter.  | CO2 | [K <sub>2</sub> ] |
| 14. Distinguish between butterworth low pass filter and chebyshev low pass filter.                                      | CO2 | [K <sub>2</sub> ] |
| 15. Compare RF BJT and RF FET.  | CO1 | [K <sub>2</sub> ] |
| 16. What are the various classes of amplifiers?   | CO3 | [K <sub>2</sub> ] |
| 17. Summarize the parameters of RF amplifiers.  | CO3 | [K <sub>2</sub> ] |
| 18. Compare the stability and VSWR features of RF amplifiers.   | CO3 | [K <sub>2</sub> ] |
| 19. Why we go for multistage amplifier?   | CO4 | [K <sub>2</sub> ] |
| 20. Select a suitable oscillator for radio frequency operation from the four oscillators given below. State the reason. | CO4 | [K <sub>4</sub> ] |
| i) Hartley oscillator   |     |                   |
| ii) YIG oscillator  |     |                   |
| iii) Colpitts oscillator  |     |                   |
| iv) Wien bridge oscillator  |     |                   |

**PART C (10 x 5 = 50 Marks)**

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|--|-----|-------------------|
| 21. Summarize the impedance response of metal film resistors.  | CO1 | [K <sub>2</sub> ] |
| 22. Explain simplified circuit diagram of the first stage of a 2 GHz power amplifier for a cellular phone.     | CO1 | [K <sub>2</sub> ] |
| 23. Summarize the attenuation response for 3 dB chebyshev design.  | CO2 | [K <sub>3</sub> ] |
| 24. Analyze and obtain kurodas four identities and summarize it in a table.                                    | CO2 | [K <sub>3</sub> ] |
| 25. Summarize the Generic hetero structure of a depletion mode HEMT.   | CO1 | [K <sub>2</sub> ] |
| 26. Analyze and Obtain equation for $I_D$ the drain current and $V_{GS}$ the gate source Voltage for a MESFET. | CO1 | [K <sub>2</sub> ] |
| 27. Describe active biasing method used RF amplifier.  | CO3 | [K <sub>2</sub> ] |
| 28. Draw the block diagram of a generic amplifier system and explain its features.                             | CO3 | [K <sub>2</sub> ] |
| 29. Explain any one type of matching network.  | CO5 | [K <sub>2</sub> ] |
| 30. Explain the various types of oscillators used in RF Receivers.   | CO4 | [K <sub>2</sub> ] |

**Answer any TWO Questions**

**PART D (2 x 10 = 20 Marks)**

31. Describe with figures and equations. High frequency resistors, High frequency capacitors and high frequency inductors. CO1 [K<sub>2</sub>]
32. Analyze a low pass filter and obtain  $H(\omega)$  and  $\alpha(\omega)$  and draw the attenuation profile of the low pass filter. CO2 [K<sub>2</sub>]
33. Describe Stability considerations and Constant gain circles concepts in RF amplifier Design. CO3 [K<sub>2</sub>]

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