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Question Paper Code: 57403

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Seventh Semester

Electronics and Communication Engineering

15UEC703-MICROWAVE ENGINEERING

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Two microwave devices using Faraday rotation principles are CO1-R
 - isolator and circulator
 - circulator and magic tee
 - directional coupler and isolator
 - none of these
- Which of the following frequency bands fall under microwave frequency? CO1-R
 - UHF and SHF
 - SHF and EHF
 - UHF, SHF and EHF
 - VHF, LF and MF
- Which type of diodes does not ordinarily operate with reverse bias? CO2-R
 - varactor
 - IMPATT
 - snap-off
 - tunnel
- When a reverse bias voltage exceeding the breakdown voltage is applied to an IMPATT diode, it results in CO2-R
 - Avalanche multiplication
 - Breakdown of depletion region
 - High reverse saturation
 - None of the mentioned
- Microwave tubes are grouped into two categories depending on the type of CO3-R
 - Electron beam field interaction
 - Amplification method
 - Power gain achieved
 - Construction methods

6. A reflex klystron is used as a(n): CO3-R
 (a) amplifier (b) oscillator
 (c) mixer (d) frequency multiplier
7. For the capacitors used in MMICs, the insulating dielectric films used are: CO4-R
 (a) Air (b) SiO
 (c) Titanium (d) GaAs
8. For the capacitors used in MMIC, the insulating dielectric films are CO4-R
 (a) Air (b) SiO (c) Titanium (d) GaAs
9. _____ instrument is used to detect the presence of CO5-U
 microwave power in a microwave circuits.
 (a) microwave detector (b) attenuator (c) probe (d) coupler
10. The reflection coefficient on a line is 0.2 angle of 45° . The SWR is CO5-R
 (a) 0.8 (b) 1.1 (c) 1.2 (d) 1.5

PART – B (5 x 2= 10Marks)

11. Define coupling factor and directivity of a directional coupler. CO1-R
12. State Two Valley Model Theory. CO2-R
13. Differentiate Klystron and TWT. CO3-R
14. List out the advantages and applications of MMIC CO4-R
15. Write the design considerations for proper operation of spectrum analyzer? CO5-R

PART – C (5 x 16= 80 Marks)

16. (a) (i) Prove that it is not possible to construct a perfectly matched, CO1-U (8)
 lossless, reciprocal 3 port junction.
 (ii) Explain the operation of magic tee with a neat sketch CO1-U (8)
- Or
- (b) (i) A three port circulator has an insertion loss of dB, an isolation CO1-U (8)
 of 20dB and VSWR of 1.2. Calculate the S-Matrix of a circulator
 (ii) Illustrate the working principle of a Faraday rotation isolator. CO1-U (8)
17. (a) What are avalanche transit time devices? Explain in detail about CO2-U (16)
 the operation and constructions of IMPATT diode.

Or

- (b) With neat diagrams, explain the operation of Tunnel diode and its application as an oscillator and amplifier. CO2-U (16)
18. (a) (i) Examine the two-cavity klystron amplifier with the effect of velocity and density modulations. CO3-Ana (8)
- (ii) A TWT has the following characteristics beam voltage $V_0 = 2$ kV, beam current $I_0 = 4$ mA, frequency, $f = 8$ GHz, circuit length, $N = 50$ and characteristic impedance $Z_0 = 20\Omega$. CO3-Ana (8)
- Determine
- (a) the gain parameter C and
- (b) Power gain in decibels.
- Or
- (b) Explain the working principle of Travelling Wave Tube (TWT) amplifiers. CO3-U (16)
19. (a) Explain the various stages involved in Monolithic Microwave Integrated Circuits technology. CO4-U (16)
- Or
- (b) Explain in detail about working of Parallel Strip line and also how matching can be carried out by Microstrip line. CO4-U (16)
20. (a) Draw the experimental set – up for s-parameters measurement of magic-T and explain how the s-parameters of a matched magic – T can be determined using Deschamp’s method? CO5-U (16)
- Or
- (b) Discuss in detail about the impedance measurement using microwave devices CO5-U (16)

