RF & MICROWAVE ENGINEERING (SEMESTER - 6)

CS/B.Tech (ECE-O)/SEM-6/EC-602/09

1. .....
Signature of Invigilator

2. .....
Signature of the Officer-in-Charge

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

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CS/B.Tech (ECE-O)/SEM-6/EC-602/09

ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

RF & MICROWAVE ENGINEERING (SEMESTER - 6)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

FOR OFFICE USE / EVALUATION ONLY

Marks Obtained

	Group – A										Group – B				Group – C				
Question Number																	***Total Marks***	***Examiner's Signature***
Marks Obtained																		

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Head-Examiner/Co-Ordinator/Scrutineer

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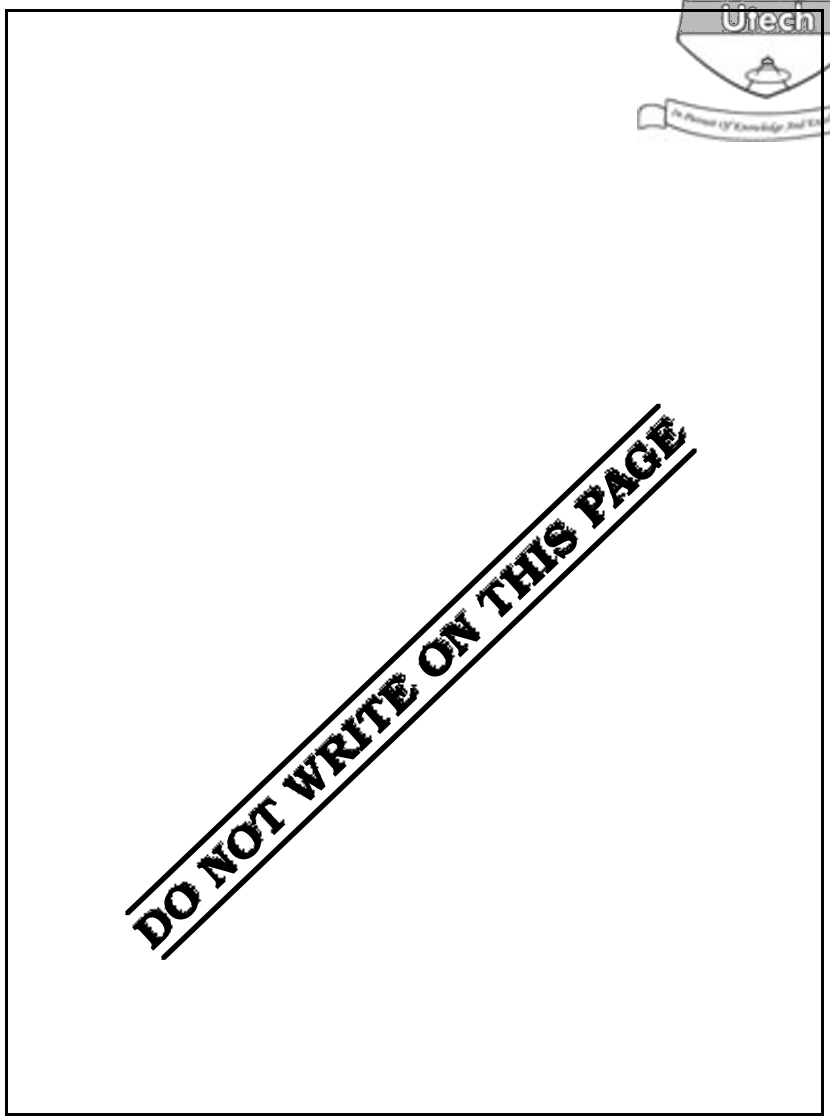
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RF & MICROWAVE ENGINEERING

SEMESTER - 6

Time : 3 Hours] [Full Marks : 70

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) Microwave components can be characterized by

a) *h*-parameter b) *y*-parameter

c) *s*-parameter d) *z*-parameter. ☐

ii) Standing wave has the separation between maxima & minima which is

a) λ b) $\frac{\lambda}{2}$

c) $\frac{\lambda}{4}$ d) $\frac{3\lambda}{4}$. ☐

iii) Rectangular waveguide does not have which one of the following modes ?

a) TM b) TEM

c) TE d) None of these. ☐

iv) Radar cross-section of a target has the unit of

a) time b) area

c) speed d) volume. ☐

v) TWT is a/an

a) oscillator b) wide band amplifier

c) tuned amplifier d) both amplifier and oscillator. ☐

vi) If the peak transmitted power in a RADAR system is increased by a factor of 16, the maximum range will be increased

a) 2 times b) 4 times

c) 8 times d) 16 times. ☐

vii) In order to couple two generators to a waveguide system, one could not use a

a) rat-race b) *E*-plane *T*

c) hybrid ring d) magic *T*. ☐

viii) Klystron operates on the principle of

a) amplitude modulation b) frequency modulation

c) pulse modulation d) velocity modulation. ☐

ix) Microwave semiconductor devices are basically

a) positive resistance device

b) negative resistance device

c) zero resistance device

d) high positive resistance device. ☐

x) Which of the following waveguide tuning components is not easily adjustable ?

a) Iris b) Stub

c) Screw d) Plunger. ☐

xi) Reflection coefficient of a short-circuited transmission line is

a) > 1 b) 1

c) – 1 d) 0. ☐

xii) A matched termination is a

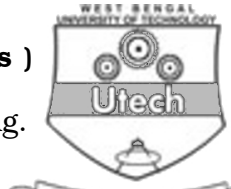
a) tapered capacitive load b) tapered inductive load

c) tapered resistive load d) tuned circuit load. ☐

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15



2. Describe the operating principle of *H*-plane and *E*-plane Tee. 5

3. Define microwave circulator. Describe the operating principle of four-port microwave circulator. 1 + 4

4. Describe the electron method of measuring microwave frequency. 5

5. Describe the operation of rotary vein attenuator. What is microwave isolator ? 3 + 2

6. What is Doppler effect ? How is it used in radar technology ? 5

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Define quality factor Q of a resonator.

   b) Define unloaded Q, external Q and loaded Q.

   c) Describe critical coupling, overcoupling and undercoupling.

   d) Draw the variation of VSWR with coupling coefficient. 2 + 5 + 5 + 3

8. a) What are the different measurement techniques for measuring microwave power ?

   b) How can you measure the microwave peak power from average power ?

   c) Explain clearly an experimental set-up to measure the high value of microwave power.

   d) Define the terms 'directivity' and 'coupling factor' of a directional coupler.

   e) What is phase shifter ? Give its applications. 3 + 2 + 5 + 2 + 3

9. a) Why is impedance matching required for transmission line ?

b) Show that a $\frac{\lambda}{4}$ transmission line can be used as an impedance $Z_O = 25\ \Omega$ and it is terminated by a load $Z_L = 100\ \Omega$. Calculate the value of reflection coefficient and VSWR. 4 + 6 + 5

10. a) With the aid of a schematic diagram, describe the travelling wave tube.

b) What is a slow wave structure ? Why does the TWT need such a structure ? Explain the beam RF interaction in such a tube.

c) What is the function of magnetic field in a travelling wave tube ?

d) The dominant mode is propagating through a waveguide with ID of a/b. Find the expressions of electric and magnetic fields inside the waveguide. 3 + 5 + 2 + 5

11. Write short notes on any *three* of the following : 3 × 5

a) TRAPATT

b) EMI and EMC

c) Backward Wave Oscillator

d) Industrial application of Microwave

e) Satellite communication.

END