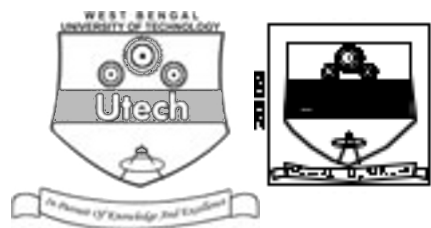


**ELECTROMAGNETIC WAVES AND RADIATING SYSTEM ( SEMESTER - 4 )**

**CS / B.TECH(ECE-NEW) / SEM-4 / EC-404 / 09**



1. ....  
Signature of Invigilator

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

Reg. No.

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Roll No. of the  
Candidate

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**CS / B.TECH(ECE-NEW) / SEM-4 / EC-404 / 09**

**ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009**

**ELECTROMAGNETIC WAVES AND RADIATING SYSTEM ( SEMESTER - 4 )**

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					Total Marks	Examiner's Signature
Question Number																						
Marks Obtained																						

.....  
**Head-Examiner / Co-Ordinator / Scrutineer**

**4583 (12/06)**



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**ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009**  
**ELECTROMAGNETIC WAVES AND RADIATING SYSTEM**  
**SEMESTER - 4**



Time : 3 Hours ]

[ Full Marks : 70

**GROUP – A****( Multiple Choice Type Questions )**1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

i) Which of the following is continuity equation ?

a)  $-\frac{\delta \rho}{\delta t} = -\text{div} J$

b)  $\text{Curl } H = i$

c)  $\text{div } D = \frac{\delta \rho}{\delta t}$

d)  $\text{Div } i = 0.$

ii) The electric field lines and equipotential lines

a) are parallel to each other

b) are one and the same

c) cut each other orthogonally

d) can be inclined to each other at any angle.

iii) UHF radio waves propagate as

a) ground wave

b) surface wave

c) sky wave

d) space wave.

iv) Antenna is a

a) transducer

b) amplifier

c) non-radiating element

d) none of these.

v) The value of  $\oint dI$  along a circle of radius 2 units is

a) zero

b)  $2\pi$ c)  $8\pi$ d)  $4\pi.$

- \_\_\_\_\_

- 

- \_\_\_\_\_

- NAME**

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**GROUP – B****( Short Answer Type Questions )**Answer any *three* of the following. $3 \times 5 = 15$ 

2. a) Explain what is meant by 'retarded vector potential'. 2 + 3
- b) Explain the concept of near field and far field. 2 + 3
3. Write down Integral form of Maxwell's equations for static electromagnetic field. Write down the four conditions at boundary surface between different media ( two conductors ). 3 + 2
4. What is the main function of an antenna ? Define radiation resistance and beam area. 2 + 3
5. Explain the characteristics of Smith chart. 5
6. Explain the following terms :  $2 \times 2 \frac{1}{2}$ 
  - a) Reflection co-efficient
  - b) VSWR.

**GROUP – C****( Long Answer Type Questions )**Answer any *three* questions. $3 \times 15 = 45$ 

7. a) What is meant by the uniform plane wave ? Derive the wave equation in the terms of electric and magnetic fields. 2 + 6
- b) Deduce Poynting theorem and explain clearly every term. Calculate power flow for a plane wave. 4 + 1 + 2
8. a) Explain the directivity of an antenna with an example. 3
- b) Give the relation between directivity and gain of an antenna. What is the limit of efficiency factor of an antenna ? 3
- c) What are half power beam width ( HPBW ) and beam width between first nulls ( BWFN ) ? 5
- d) Define radiation resistance of folded dipole antenna. Why is it beneficial for our TV reception antenna ? 4



9. a) Define characteristic impedance of a transmission line. Explain the formation of standing wave pattern on transmission line. 2 + 3
- b) Deduce relation between reflection co-efficient and VSWR. 5
- c) A transmission line of characteristic impedance  $50\Omega$  is terminated by resistor of  $100\Omega$ . What will be the VSWR in the line ? Calculate impedances at the voltage minimum and maximum positions. 5
10. a) Discuss the important features of sky wave propagation and explain the terms : 6
- i) Virtual height
- ii) Skip distance
- iii) Critical frequency.
- b) Explain how troposphere ducts are formed. 4
- c) A HF radio line is established for a range of 2000 km. If the reflection region of the ionosphere is at a height of 200 km and has critical frequency  $f_c = 6$  MHz, calculate MUF. 3
- d) What are different modes of propagation of electromagnetic wave ? 2
11. Write short notes on any *three* of the following : 3 × 5
- a) Skin depth
- b) Ground wave propagation
- c) Horn antenna
- d) Propagation constant and its frequency dependence.
- e) Boundary conditions for electric and magnetic fields.

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END