Total No. of Questions : 8]

SEAT No. : [ ]

P101

[Total No. of Pages : 3

[5871]-603
B.E. (E & TC)
Radiation and Microwave Techniques
(2015 Pattern) (Semester - I)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Two lossless X-band (8.2-12.4 GHz) horn antennas are separated by a distance of 100λ. The reflection coefficients at the terminals of the transmitting and receiving antennas are 0.1 and 0.2, respectively. The maximum directivities of the transmitting and receiving antennas (over isotropic) are 16 dB and 20 dB, respectively. Assuming that the input power in the lossless transmission line connected to the transmitting antenna is 2W, and the antennas are aligned for maximum radiation between them and are polarization-matched, find the power delivered to the load of the receiver. **[6]**

b) Compare the various radiating dipole elements in terms of antenna parameters. **[6]**

c) Explain the structural details, types and applications of strip line. **[8]**

OR

Q2) a) Explain the following terms related to antenna: **[6]**

i) Radiation Pattern

ii) Radiation Efficiency

iii) Antenna impedance

b) Explain the construction and principle of operation of Yagi-Uda Antenna. **[6]**

c) With neat diagram explain the working of a rectangular cavity resonator. Obtain the expression for resonant frequency of oscillation. Calculate the lowest resonant frequency of a rectangular cavity resonator of dimensions a = 2 cm, b = 1 cm and d = 3cm. **[8]**

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Q3) a) Explain the S-matrix of Magic Tee. Explain with neat diagram the application of Magic Tee for unknown impedance measurement. **[8]**

b) Explain the working principle, construction and applications of Isolator. An isolator has an insertion loss of 0.35dB and an isolation of 50dB. Determine the scattering matrix of the isolator if the isolated ports are perfectly matched to the junction. **[8]**

OR

Q4) a) Explain and compare the properties of E-plane and H-plane Tee with neat diagram. Also derive scattering matrix of E plane Tee. **[8]**

b) Explain with neat diagram the construction and principle of operation of a two hole directional coupler. **[8]**

Define:

i) Coupling coefficient

ii) Directivity

iii) Isolation

Q5) a) Explain the high frequency limitations of conventional tubes. Classify Microwave Tubes. **[8]**

b) Explain the construction, working principle and application of the following: **[8]**

i) Microwave Tunnel Diode

ii) Varactor Diode

OR

Q6) a) Explain the concept of Velocity Modulation. Explain the principle of working of a Reflex Klystron with an Applegate diagram. **[8]**

b) Explain the construction, working principle and application of the following: **[8]**

i) PIN diode as a modulator

ii) Schottky Barrier Diode

Q7) a) Explain Microwave terrestrial and satellite communication systems. Differentiate between these two. **[6]**

b) How VSWR of a device under test is measured using a slotted line and VSWR meter. **[6]**

c) Calculate the SWR of a transmission system operating at 10 GHz. Assume TE_{10} wave transmission inside a rectangular waveguide of dimensions a = 4 cm, b = 2.5 cm. The distance measured between twice minimum power points is 1 mm on a slotted line. **[6]**

OR

Q8) a) How to measure the phase shift introduced by a microwave network. Explain with suitable set-up and example. **[6]**

b) Explain with neat diagram the mechanism of microwave heating in microwave ovens. **[6]**

c) Explain in detail the various types of Microwave Radiation Hazards. How the radiation protection can be practiced? **[6]**

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