Total No. of Questions : 8]

SEAT No. : ____

PA-937

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B. E. (Electronics and Telecommunication Engg.)
RADIATION AND MICROWAVE THEORY
(2019 Pattern) (Semester - VII) (404181)

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

Instructions to the candidates:

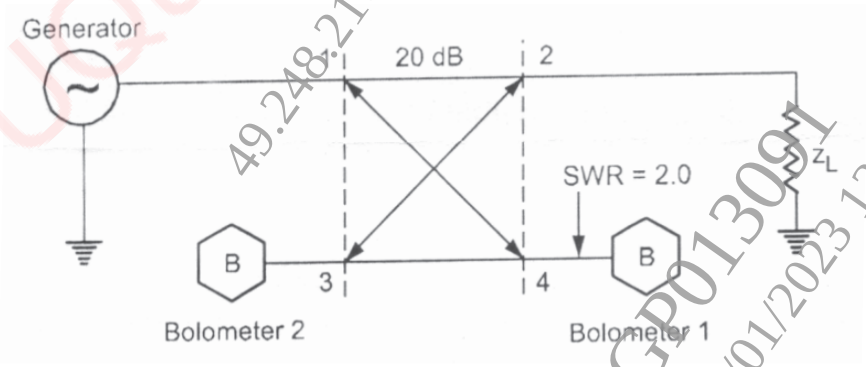
1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) a) With the help of suitable diagram explain the how Magic Tee is used for measurement of unknown impedance. **[6]**

b) A symmetric directional coupler with infinite directivity and a forward attenuation of 20Db is used to monitor the power delivered to a load Z_L in below Figure. Bolometer 1 introduces a VSWR of 2.0 on arm 4; bolometer 2 is matched to arm 3. If bolometer 1 reads 8mW and bolometer 2 reads 2 mW, find: **[6]**

i) the amount of power dissipated in the load Z_L;

ii) the VSWR on arm 2.



c) With the help of constructional details explain the operating principle of Isolator. **[5]**

OR

P.T.O.

Q2) a) Explain the roll of Microwave Attenuator. Explain the Card/Fixed type of attenuator. **[5]**

b) Enlist the characteristics of Scattering Matrix. Derive the scattering matrix for H-Plane Tee. **[6]**

c) With the help of suitable diagram explain the operation of Two-hole directional coupler. **[6]**

Q3) a) What is the slow wave structure? Explain how a helical TWT achieves amplification. **[6]**

b) With the help of Constructional Details explain the operating principle of Reflex Klystron. **[6]**

c) How bunching is achieved in cavity Magnetron. Explain the phase focusing effect. **[5]**

OR

Q4) a) Distinguish between the Klystron tube and Travelling wave tube amplifier. **[6]**

b) A 2-cavity Klystron amplifier has the following characteristics: Voltage. **[6]**

gain = 15 dB

Input power = 5 mV

Rsh of input cavity = 30 KΩ

Rsh of output cavity = 40 KΩ

RL (load impedance) = 40 KΩ

Determine:

i) The input r.m.s. voltage

ii) The output r.m.s. voltage

iii) The power delivered to the load.

c) What are the limitations of conventional tubes at microwave Frequencies. **[5]**

Q5) a) Explain the constructional detail and operation of Microwave transistor. **[6]**

b) Define negative differential resistivity. Explain the V-I characteristics of Gunn diode using two valley theorem. **[6]**

c) What is a PIN diode? Describe the construction of a PIN diode and also its characteristics. **[6]**

OR

Q6) a) Explain the operation of Varactor diode. Discuss the constructional details, equivalent circuit and figure of merit. Mention its applications. **[6]**

b) An IMPATT diode has a drift length of 2μm. Determine **[6]**

i) the drift time of the carrier

ii) the operating frequency of the diode.

c) What are the avalanche transit time devices? Explain the working principle of TRAPATT diode. **[6]**

Q7) a) Calculate the SWR of a transmission system operating at 10 GHz. **[6]** Assume TE10 wave transmission inside a waveguide of dimensions a = 4 cm, b = 2.5 cm. The distance measured between twice minimum power points = 1 mm on a slotted line.

b) Using suitable block diagram explain the operating principle of RADAR. Enlist the applications of RADAR. **[6]**

c) What is Terrestrial microwave Communication System. Enlist its advantages and Limitations. **[6]**

OR

Q8) a) Write a note on : Medical Application such as Microwave Diathermy. **[6]**

b) What are the hazards of Electromagnetic Radiations? Explain the different types of Radiation Hazards. **[6]**

c) A 10GHz RADAR has the following characteristics, peak transmitted power = 250kW; power gain of antenna = 2500; minimum detachable peak signal power by receiver = 10^{-14} watts; cross sectional area of the RADAR = $10m^2$. If this RADAR were to be used to detect a target of $2m^2$ equivalent cross section, find the maximum range possible. **[6]**

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