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

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

Instructions to the candidates:

   1)   *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*

   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 as a Mixer. **[5]**

    b)   What are the different performance parameters of directional coupler. Explain the operation of two hole directional coupler. **[6]**

    c)   Determine the [S] of a 3-port circulator. Given insertion loss of 0.5 dB, isolation of 20 dB and VSWR of 2. **[6]**

<div align="center">OR</div>

Q2) a)   Discuss 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 E-Plane Tee. **[6]**

    c)   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 arm4; bolometer 2 is matched to arm 3. If bolometer 1 reads 8mW and bolometer 2 reads 2 mW, find: i) the amount of power dissipated in the load Z_L; ii) the VSWR on arm 2. **[6]**

Figure
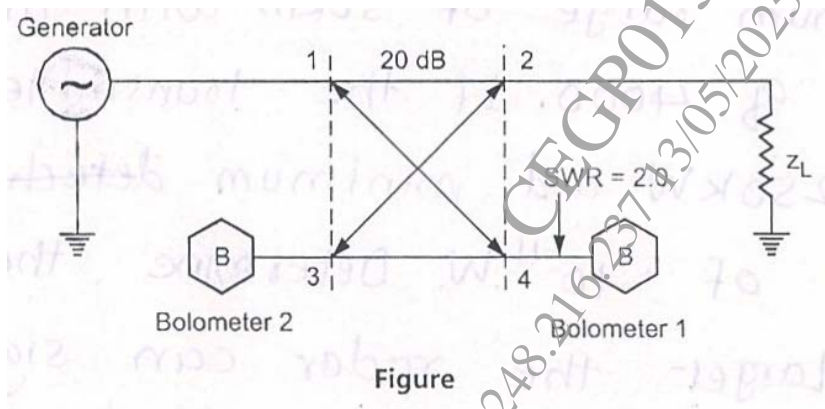
Q3) a) Distinguish between the Klystron tube and Travelling wave tube amplifier. **[6]**

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

c) What is the slow wave structure? Explain how a helical TWT achieves amplification. **[5]**

OR

Q4) a) Explain the working principle of two cavity Klystron Amplifier. **[6]**

b) A reflex klystron operates at the peak mode of n=2 with V_0 280V, $I_0 = 22$mA and signal voltage $V_1 = 30$V, Determine (i) the input power, (ii) the output power, and (iii) the efficiency. **[6]**

c) Explain the HF limitations of Conventional tube. **[5]**

Q5) a) What is parametric Amplifier? How it is different from a normal amplifier. **[6]**

b) Describe the several domain formation modes of a Gunn diode. **[6]**

c) With the help of circuit diagram explain the Schottky Barrier Diode. **[6]**

OR

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

b) With the help of Energy band diagram explain how Tunnel diode exhibits negative resistance in the part of its forward characteristics. **[6]**

c) Discuss the application of PIN diode as a switch. **[6]**

Q7) a) A slotted line is used to measure the frequency and it was found that the distance between the nulls is 1.85 cm. Given guide dimensions are (3×1.5) cm. Calculate the value of frequency measured between twice minimum power points ± 1 mm on a slotted line. **[6]**

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

c) With the help of suitable block diagram explain the measurement of VSWR using double minima method. **[6]**

OR

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

b) Write a note on radiation hazard levels for personnel. **[6]**

c) A marine radar operating at 10GHz has a maximum range of 50kM with an antenna gain of 4000. If the transmitter has a power of 250 kW and minimum detectable signal of 10^{-11}W. Determine the cross section of the target the radar can sight. **[6]**

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