

**B.Tech. - VIEP - ELECTRONICS AND
COMMUNICATION ENGINEERING
(BTECVI)**

Term-End Examination

December, 2016

00043

BIEL-016 : MICROWAVE AND RADAR ENGINEERING

Time : 3 hours

Maximum Marks : 70

Note : Attempt any seven questions. Assume suitable missing data, if any. Question no. 1 is compulsory. Use of scientific calculator is allowed.

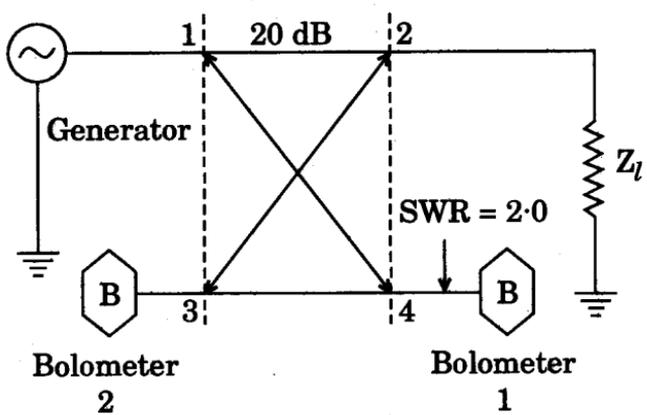
1. (a) What is the dominant mode of operation in a waveguide? Explain with an example.
- (b) Plot and briefly explain the graph between coupling coefficient and standing wave ratio.
- (c) How can the characteristic impedance and propagation constant of a transmission line be measured?
- (d) Differentiate between CW and Pulse Radar.
- (e) Briefly explain the Doppler effect in Radar operation. 5×2=10
2. (a) Solve the Helmholtz equation for a rectangular coordinate system considering different cases. Find the solution when the waveguide operates in TM_{mn} mode. 5
- (b) What is circular waveguide? Explain. 5

3. (a) Explain the principle of microwave resonator and find out the frequency in case of a semi-circular cavity resonator. 5

(b) Explain about the waveguide corners, bends and twists and their usage in a transmission line. 5

4. (a) Explain the basic principle of a two-hole directional coupler along with its S-matrix. 5

(b) A symmetric directional coupler with infinite directivity and a forward attenuation of 20 dB is used to monitor the power delivered to a load Z_L . Bolometer 1 introduces a VSWR of 2.0 on arm 4; bolometer 2 is matched to arm 3. If bolometer 1 reads 8 mW and bolometer 2 reads 2 mW, find (a) the amount of power dissipated in the load Z_L , and (b) the VSWR on arm 2. 5



5. (a) Explain two-cavity klystron amplifier with necessary block diagram and write down the equation of velocity modulation. 5
- (b) Explain the basic principle of a Tunnel diode with $V - I$ characteristic. 5
6. (a) Explain the operation of a TRAPATT diode by drawing its structure. 7
- (b) Calculate the avalanche zone velocity of a TRAPATT diode having the following parameters : 3
- Doping Concentration : $2 \times 10^{15} \text{ cm}^{-3}$
- Current Density : 20 kA/cm^2
7. (a) Explain the operation of Pulse Radar with necessary block diagram. Mention how a Delay line canceller can act as a filter. 5
- (b) Discuss the operation of Frequency Modulated CW Radar by drawing its block diagram. 5
8. Explain the operation of MT Radar having power-amplifier transmitter with block diagram. 10

9. Write short notes on any *two* of the following : *2×5=10*

- (a) Microwave Isolator
 - (b) PIN Diode
 - (c) Radar Displays
 - (d) Tracking Radar
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