

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

00900

Term-End Examination

December, 2014

BIEL-016 : MICROWAVE AND RADAR ENGINEERING

Time : 3 hours

Maximum Marks : 70

***Note :** Attempt any **seven** questions. Use of scientific calculator is allowed. Make suitable assumptions if required.*

1. Derive the expression for various field components for a rectangular waveguide assuming wave propagation along +z direction of the rectangular co-ordinate system. 10

2. (a) Write a short note on micro-strip lines. 5
(b) Discuss the power loss in a rectangular waveguide. 5

3. An air filled rectangular, waveguide with dimensions $2\text{ cm} \times 1\text{ cm}$ is operating at a frequency of 11 GHz.
Find the following : 10
 - (i) Possible modes
 - (ii) Cut-off frequency
 - (iii) Guide wavelength

4. (a) Explain the operation of E-plane, H-plane Tee Junctions. Derive the scattering matrix of these Tees. 5
- (b) Write a short note on Excitation of Resonator cavities.
5. (a) Two identical 30 dB directional couplers are used to sample incident and reflected power in waveguide. VSWR = 2 and the output of the coupler sampling incident power = 4.5 mW. What is the value of reflected power? 5
- (b) Write short note on the measurement of impedance at microwave frequency. 5
6. Derive the expression of cut-off magnetic field in case of parallel plate magnetron. 10
7. (a) A military radar operates at 5 GHz with 2.5 mW power output if antenna diameter is 5 m, the receiver bandwidth is 1.6 MHz and has a 12 dB noise figure. What is the maximum detection range for 1 m² target? 5
- (b) Explain A-scope and PPI display with reference to radar. What are their limitations? 5

8. Explain the action of
- (i) CW doppler radar
 - (ii) FMCW doppler radar
- Also discuss their applications and limitations. 10
9. (a) An MTI radar operates at 5 Hz with a pulse repetition frequency (PRF) of 800 PPS. Determine the lowest three blind speeds of this radar. 5
- (b) Explain the basic principle of a radar system. Give the limitations and applications of radar.
10. Write short notes on any *two* of the following : 10
- (a) Pin Diode
 - (b) TRAPATT
 - (c) Radar Clutter
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