

Roll No.

Total Pages : 03

BT-8/M-19 38140
MICROWAVE ENGINEERING
ECE-404N Opt. (II)

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

1. (a) Find the ~~lowest four cut-off frequencies~~ for an air filled rectangular wave guide when $a/b = 2$ with $a = 4$ cm. Also find the modes that can be used to transit 8 GHz. 8
- (b) Derive the unloaded quality factor of rectangular cavity for its dominant mode. 7
2. (a)✓ Explain the slotted line method of impedance measurement. 8
- (b)✓ Explain the down conversion method of frequency measurement. 7

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Unit II

3. (a) A Reflex Klystron operates under the following condition Beam Voltage (V_0) = 600 V, drift space length (L) = 1 mm, shunt resistance of the cavity (R_{sh}) = 15 K Ω and $f_c = 9$ GHz. The tube is oscillating at f_c at the peak of the $n = 2$ mode or $1(3/4)$ mode. Beam loading and transit time effects are neglected. Determine (i) Repeller Voltage (ii) Direct current necessary to give a microwave gap voltage of 200 V. (ii) Electronic efficiency. 9
- (b) Explain the π -mode oscillation phenomenon and its importance for Cylindrical Magnetron. 6
4. (a)✓ Explain the bunching process with necessary expressions of Two Cavity Klystron amplifier ? 8
- (b)✓ A helix travelling wave tube is operated with a beam current of 300 mA beam voltage of 5 kV and characteristics impedance of 20 Ω . Find the length of the helix to give an output power gain of 50 dB at $f = 10$ GHz ? 7

Unit III

5. (a)✓ Describe the operation of B-plane Tee and derive its S-matrix. 8
- (b)✓ Explain the working of precision phase shifter and its Matrix in detail. 7

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6. (a) Explain Faraday rotation isolator in detail. 8
(b) Explain the operation of Directional coupler and derive its S-matrix. 8

Unit IV

7. (a) Explain the negative differential phenomenon of GUNN Diode using two valley model theory ? 8
(b) Explain the construction and operation of IMPACT diode in detail. 8
8. (a) An IMPATT diode has the following parameters :
Carrier drift velocity = 10^5 m/s, length of drift space is 5 μ m, maximum operating current is 150 mA, maximum operating voltage is 80 volt, and efficiency is 10%. Calculate (i) CW Power output, (ii) Frequency of oscillation produced. 8
(b) Explain the construction and operation of TRAPATT diode. 8

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