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B. E. (Seventh Semester) Examination, Nov.-Dec. 2021

(New Scheme)

(ET&T Engg. Branch)

MICROWAVE COMMUNICATION and ENGINEERING

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Part (a) of each unit is compulsory. Attempt any* ***two*** *parts from (b), (c) and (d) from each unit.*

Unit-I

1. (a) What is the function of slow wave structure in TWT? 2

   (b) Explain reason of failure of conventional tubes at microwave frequencies. 7

(c) Describe the two cavity Klystron amplifier with neat diagram. Also explain velocity modulation and bunching process. 7

(d) A Reflex Klystron has the following parameters :

$V_0 = 800$ volt, $L = 1{\cdot}5$ mm, $Rsh = 15k\,\Omega$, $F = 9$ GHz. 7

Calculate :

(i) Repeller voltage for $1\frac{3}{4}$ mode.

(ii) Direct current necessary to give microwave gap voltage of 200 volt.

(iii) Efficiency.

Assume $\beta = 1$ and for $X' = 1{\cdot}841$, $J_1(X') = 0{\cdot}582$

Unit-II

2. (a) What are the differences between linear beam tubes and crossed field tubes? 2

(b) Derive an expression for Hull cut-off voltage and Hull cut-off magnetic flux density for cavity magnetron. 7

(c) Derive an expression for power output and efficiency of forward cross field amplifier. 7

(d) A pulsed cylindrical magnetron is operated with the following parameters : 7

Beam current = 27 amp.

Anode voltage = 26 k volt

Magnetic flux density = 0.336 Wb/m^3

Radius of cathode cylinder = 5 cm

Radius of anode cylinder = 10 cm

Calculate :

(i) The angular frequency

(ii) The cut-off voltage

(iii) The cut-off magnetic flux density

Unit-III

3. (a) What are the advantages of JFET over BJT? 2

(b) Withe the help of schematic diagram explain how PIN diode used as : 7

(i) Switch

(ii) Phase shiffer

(iii) Amplitude modulation

(c) What are MESFET? Explain the construction, operation, performance characteristics and their applications. 7

(d) Explain the principle of operation for Tunnel diode with the help of energy band diagram. 7

Unit-IV

4. (a) Which material is used is Gunn diode and why? 2

(b) Explain the operation of IMPATT diode an compare with TRAPATT diode. 7

(c) Explain various operating mode of a Gunn diode. 7

(d) Explain parametric up converter and parametric down converter. 7

Unit-V

5. (a) Differentiate between an E-plane tee and H-plane tee. 2

(b) Derive the scattering matrix of E-plane Tee. 7

(c) Explain the microwave bench setup with its block diagram. Describe Bolometer method of power measurement. 7

(d) Draw the schematic diagram of magic tee. Derive its s-matrix explain working. 7