

328712 (28)

BE (7th Semester)

Examination, Nov.-Dec., 2021

Branch : Et & T

**MICROWAVE COMMUNICATION &
ENGINEERING**

Time Allowed : Three Hours

Maximum Marks : 80

Minimum Pass Marks : 28

- Note :**
- (i) Part (a) in each question is compulsory.
 - (ii) Attempt any two parts from b, c & d.
 - (iii) Assume suitable data wherever necessary.
 - (iv) Answer should be brief and to the point.

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P.T.O.

(2)

- Q. 1. (a) Define skip distance. 2
- (b) Derive an expression for field strength of tropospheric wave. 7
- (c) What is an elevated duct? Explain ground based duct propagation. 7
- (d) A T.V. transmitter antenna has a height of 144 meter and the receiving antenna has a height of 25 meters. What is the maximum distance through which the TV signal should be received by space wave propagation? What is the radio horizon in this case? 7

(3)

Q. 2. (a) What is the effect on an electron that enters the buncher gap, when the potential across the grids is at zero volts ? 2

(b) Derive expression for four propagation constant which represent four different mode of wave propagation of the helical Travelling Wave Tube (TWT). 7

(c) Obtain expression for the relationship between the repeller voltage (V_R) and number of cycle (n) required for oscillation for a given beam voltage V_0 . 7

(4)

(d) A four-cavity Klystron amplifier has the following parameters : 7

Beam Voltage ; $V_0 = 20$ KV.

Beam Current ; $I_0 = 2$ A

Operating frequency ; $f = 9$ GHz.

dc charge density ; $\rho_0 = 10^{-6}$ c/m³

RF charge density ; $\rho = 10^{-8}$ c/m³

Velocity perturbation ; $v = 10^5$ m/s

Determine :

- (i) The dc electron velocity.
- (ii) The dc phase constant.

(5)

(iii) Plasma frequency.

(iv) Reduced plasma frequency for $R = 0.5$

(v) The beam current density.

(vi) The instantaneous beam current density.

Q. 3. (a) What is parametric amplifiers? 2

(b) With suitable diagram, explain how GUNN diode can be used as an oscillator and amplifier. 7

(c) State the difference between IMPATT and TRAPATT. 7

(d) Explain operation and characteristics of Tunnel diode. 7

(6)

Q. 4. (a) Differentiate between an E plane tee and an H plane tee. 2

(b) Explain the action of isolator and circulator using ferrites. 7

(c) Explain two hole directional coupler and derive its S-matrix. 7

(d) Imagine that a source is connected to arm 'P' and arm 'S' is match terminated. Arm 1 and 2 are terminated in reflection coefficients of 0.2 and 0.3 respectively.

What is VSWR seen by the source? 7

(7)

Q. 5. (a) What is the drawback of filter design by image parameter method ? 2

(b) Explain the process of filter design by the insertion loss method. 7

(c) Design a band pass filter having a 0.1 dB Chebyshev response with $N = 3$. The centre frequency is 2 GHz, the bandwidth is 200 MHz and impedance is 50Ω .

The element values for low pass prototype circuit are given as : 7

(8)

$$g_1 = 1.0315$$

$$g_2 = 1.1474$$

$$g_3 = 1.0315$$

$$g_4 = 1.000$$

(d) Explain wave analysis of periodic structures.

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