328712(28)

B. E. (Seventh Semester) Examination, April-May 2020

(Old Scheme)

(Et&T Engg. Branch)

MICROWAVE COMMUNICATION & ENGINEERING

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Part (a) of each question is compulsory. Solve any two from part (b), (c) and (d). Answer in sequence only. Assume the missing data.

Unit-I

1. (a) What do you mean by critical frequency?   2

   (b) Explain how earth magnetic field affects the propogation of radiowave in the inosphere.   7

(c) (i) Give the difference between maximum usable frequency (MUF) and optimum working frequency.   3

(ii) Prove that skip distance (D) is given by

$$D = 2h \sqrt{\left(\frac{f}{f_c}\right)^2 - 1}$$ 4

(d) The observed critical frequency of E and F layer at Guwahati, at a particular time are 2·5 MHz and 8·4 MHz respectively. Calculate the maximum electrons concentration of the layer.   7

Unit-II

2. (a) What do you mean by velocity modulation?   2

(b) Derive the expression for output power and efficiency for reflex klystron and prove that $\eta_{max} = 22 \cdot 7\%$.   7

(c) What do you mean by magnetron? Explain its principle and operation.   7

(d) A two cavity Klystron is operated at 10 GHz with,

Beam voltage : $V_0 = 900$ V

Beam current : $I_0 = 30$ mA

Gap spacing : $d = 1$ mm

Spacing between cavities : $L = 4$ cm

Effective shunt resistance : $R_{sh} = 40$ kΩ

Neglecting beam loading :

Calculate :

(i) Inpute RF voltage (V_1) for maximum output voltage.

(ii) Voltage gain

(iii) Efficiency   7

Unit-III

3. (a) What do you mean by transfer electron device (TED)?   2

(b) What do you mean by GUNN Diode? Explain its various mode of operation.   7

(c) (i) What do you mean by Avalanche Transit Time device? Explain the operation of IMPATT diode.   5

(ii) An IMPATT diode has a drift length of $2 \mu m$.

Determine (Taking $V_d = 10^5$ cm/sec).

(a) The drift time of the carrier

(b) The operation frequency of the diode   2

(d) Explain the V-I characteristics of Tunnel diode and explain Tunnel diode w.r.t. energy band.   7

Unit-IV

4. (a) What do you mean by s-parameter and write its properties?   2

(b) Derive the s-parameter matrix for magic Tee and explain why it is called magic Tee.   7

(c) How we can measure microwave power using biometric method?   7

(d) In an H-plane Tee junction, 20 mW power is applied to port-3 that is perfectly matched to the junction. Calculate the power delivered to the load $60\,\Omega$ and $75\,\Omega$ connected to port-1 and port-2. If the characteristic impedance of line is $50\,\Omega$.   7

Unit-V

5. (a) Sketch attenuation response for constant k, m derived and composite filter.   2

(b) Explain how low pass to high pass frequency transformation can be achieved.   7

(c) Explain the process of filter design using insertion loss method.   7

(d) Explain impedance scaling and frequency scaling related to filter formation.   7