

Con. 3160-11.

(REVISED COURSE)

RK-2610

(3 Hours)

[Total Marks : 100

- N. B. :** (1) Question No. 1 is **compulsory**.
 (2) Solve any **four** from **remaining** questions.
 (3) Assume **suitable** data wherever **required** but **justify** it.
 (4) **Figures** to the **right** indicate **full** marks.

1. Solve the following : 20
 What do you understand by the terms :-
 (a) Cutoff Wavelength
 (b) Phase Velocity
 (c) Dominant Mode
 (d) Wave Impedance ?
2. (a) What are the limitations of conventional tubes at microwave frequencies ? Explain how these limitations can be overcome. 10
 (b) What is velocity modulation ? How it is different than normal modulation ? Explain how velocity modulation is utilised in Klystron amplifier. 10
3. (a) What are the crossfield devices ? How does a magnetron sustain its oscillations using its crossfields ? Explain Pi mode for the same. 10
 (b) A 2 cavity Klystron amplifier has the following parameters : 10
 $V_0 = 1000 \text{ V}$; $R_0 = 40 \Omega$, $I_0 = 25 \text{ mA}$, $F = 3 \text{ GHz}$.
 Gap spacing in either cavity $d = 1 \text{ mm}$, $h = 4 \text{ cm}$, $R_{sh} = 30 \text{ k}\Omega$.
 (i) Find input gap voltage to give maximum voltage V_2 .
 (ii) Find the voltage gain neglecting the beam loading in the output cavity.
 (iii) Find efficiency of the amplifier.

4. (a) An air filled rectangular waveguide of inside dimension 7×3.5 cm operates in dominant mode : 10
- (i) Find cutoff frequency.
 - (ii) Determine phase velocity of wave in the guide at a frequency of 3.5 GHz.
 - (iii) Determine the guided wavelength at same frequency.
- (b) Derive wave equation for TM wave and obtain all the field components in rectangular waveguide. 10
5. (a) What are cavity resonators ? Derive the equations for resonant frequencies for a rectangular and circular cavity resonator. 10
- (b) Explain the operation of E-plane, H-plane and E-H plane T with their S-matrix. 10
6. (a) Describe in detail operation of 2-hole directional coupler. Calculate Coupling factor if power in primary waveguide is 72 m watt and power delivered to the directional coupler is 8 m watt. 10
- (b) Calculate the SWR of a X mission system operating at 10 GHz. Assume TE_{10} wave transmission inside a waveguide of dimensions $a = 4$ cm, $b = 2.5$ cm. The distance measured between twice minimum power points = 1 mm on a slotted line. 10
7. Write short notes on :— 10
- (a) Gunn diode
 - (b) Microwave transistors
 - (c) Faraday Rotation
 - (d) Measurement of microwave power.
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