



JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), April-May 2015

B. Tech in Electronics and Communication Engineering, Semester IV

Roll No.....

COURSE CODE: MICROWAVE ENGINEERING I CEE-47 Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A	Objective type multiple choice questions (10 questions @ 1 mark)	10
i.	Indicate the false statement. The SWR on a transmission line is infinity; the line is terminated in (a) A short circuit (b) a complex impedance (c) an open circuit (d) a pure reactance	
ii.	For a rectangular guide 2.5 cm X 1.0 cm, the cutoff wavelength of dominant mode is (a) 1.25 cm (b) 2.0 cm (c) 1.0 cm (d) 5 cm	
iii.	Modes are propagating modes in a rectangular waveguide (a) TE ₀₀ and TM ₀₀ (b) TE ₀₀ and TM ₁₀ (c) TM ₀₁ and TM ₁₀ (d) TE ₁₀ and TM ₁₁	
iv.	In general, a rectangular waveguide transmission line acts like a (a) Band filter (b) Low pass filter (c) High pass filter (d) Tuned filter	
v.	In a rectangular waveguide, which of the following modes are known as degenerate modes (a) TM ₀₁ and TM ₁₀ (b) TE ₁₁ and TM ₁₁ (c) TM ₀₁ and TM ₁₀ (d) TE ₁₀ and TM ₀₁	
vi.	An air filled rectangular cavity resonator resonates at 8 GHz. If it is filled with a dielectric of permittivity 4.0, its resonant frequency will be (a) 8 GHz (b) 2 GHz (c) 16 GHz (d) 4 GHz	
vii.	The Q factor measures (a) Frequency selectivity (c) energy stored in the cavity (b) Energy dissipation (d) all of these	
viii.	The following doping structure does not belong to the IMPATT family n ⁺ pip ⁺ (b) p ⁺ nin ⁺ (c) p ⁺ nn ⁺ (d) n ⁺ pin ⁺	
ix.	At VHF, the skin effect losses in conventional tubes are proportional to 1/√f (b) 1/f (c) f (d) √f	
x.	Waveguide cavities cannot be used at very high frequencies because of (a) Small dimension (b) low Q (c) both (a) and (b) (d) none of these	
Q.2	Short answer type questions (4 questions @ 2.5 marks)	10
	(a) Gunn effect (c) Materials used in MMIC (b) Velocity modulation (d) Ruby MASER	



Q.3A	What are the degenerate modes and how they differ from dominant modes ?	05
Q.3B	Define and explain the meaning of the term standing-wave ratio. What is the formula for it if the load is purely resistive?	05
Q.4A	With the suitable figure, describe the basic operation of a reflex klystron.	05
Q.4B	Describe the operating principle of a TRAPATT diode	05
Q.5A	Draw the schematic diagram of a helix TWT amplifier and explain the mechanism of operation.	05
Q.5B	What are the advantages and disadvantages of circular waveguide over rectangular wave guide.	05
Q.6A	Discuss the difference between transferred electron device and avalanche transit time device.	05
Q.6B	Draw and explain the cavity resonator.	05
	OR	
Q.6B	Define quality factor of a cavity resonator.	05
Q.7A	With the aid of cross sectional sketch of a magnetron , explain the operation of the device?	05
Q.7B	A cylindrical waveguide has a inner radius of 2 cm. Find the cut off frequency for the guide operating in TE ₁₁ mode. Calculate λ_g and Z_{TE} at 10 GHz.	05
	OR	
Q.7B	A rectangular waveguide of inner dimensions 2.5 cm X 1.2 cm is to propagate energy in TE ₁₀ mode. Calculate the cut off frequency. If the frequency of signal is 1.2 times of this cutoff frequency, compute the guide wavelength and phase velocity.	05
Q.8A	The bunching grids of a Klystron amplifier are 2 mm apart. The beam voltage is 2 kv and the drift space is 2.8 cm long. What must be the value of the RF voltage at the bunching grid to produce a maximum fundamental component of the current at the catcher? Assume the operating frequency is 2.8 GHz. Find Transit angle (θ_0), Average transit angle (θ_g), beam coupling coefficient (β_i) and voltage at the bunching grid at a Klystron for maximum fundamentals components of the current at the catcher (V_{1max}).	10
Q.9A	A 100 Ω coaxial line with air as dielectric is terminated by a load impedance 75 +j40 Ω and is excited at 1 GHz by a matched generator. Find the position and the length of stub for matching stub using smith chart.	10
Q.9B	A rectangular waveguide has dimensions 2.5 cm X 5 cm, Determine the guide wavelength λ_g , phase constant β and phase velocity V_p at a wavelength of 4.5 for the dominant mode.	10
	OR	
Q.9B	An air filled cavity with dimensions a = 5 cm, b = 4 cm and c = 10 cm is made of copper. It is filled with a lossless material (μ_r 1), (ϵ_r = 3). Find the resonant frequency for TE ₁₀₁ mode.	10



The Complete Smith Chart

