Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2019

Programme Name: B.Tech ASEA **Semester : VI**
Course Name : Microwave Engineering **Time : 03 hrs**
Course Code : ELEG415 **Max. Marks : 100**
Nos. of page(s) : 01
Instructions: Attempt all questions. All Questions are compulsory.

SECTION A

S. No.		Marks	CO
1.	A rectangular waveguide with dimension of 3 cm x 2 cm operates in the TM_{10} mode at 10 GHz. Determine the characteristics wave impedances.	5	CO1
2.	A 20 mW signal is fed into port 1 of a lossless directional complex of coupling coefficient 20dB & directivity 50 dB. Find the power at the output port i.e at port1.	5	CO3
3.	Derive the Scattering matrix for E-plane Tee.	5	CO2
4.	Explain the Gunn's effect using the two valley theory (RWH).	5	CO4
	SECTION B		
5.	Explain the double minimum method of measuring VSWR.	10	CO5
6.	A TWT operates under the following parameters: Beam current: I_0= 50mA Beam Voltage: V_0= 2.5 kV Characteristic impedance of helix: Z_0 = 6.75 Ω Circuit Length: N = 45 Frequency: f= 8 GHz Determine: a. The gain parameter C. b. The output power gain A_P in dB. c. All the four propagation constants.	10	CO3
7.	What are Crossfield devices? Derive an expression for the Hull cutoff magnetic flux density of cylindrical cavity magnetron.	10	CO4
8.	Name microwave devices, which make use of Faraday rotation. Explain the construction and working of any one of them.	10	CO2
	SECTION-C		
9.	With a neat diagram of TRAPATT diode, explain the principle of operation with neat figures. Avalanche zone velocity of a TRAPATT diode has following parameters: Doping concentration NA = 2.1015 cm-3, current density J = 20 KA/cm^2. Calculate the avalanche-zone velocity. Assume that the equation of velocity modulation of the an electron at the time, t_1 when electron leaving the buncher cavity gap is $\upsilon(t_1)=\upsilon_0$ ¿]	20	CO4
10.	With a neat diagram explain the working of two-cavity klystron amplifier and derive expression for the efficiency of above amplifier starting from basic principles. Or Write in brief, what is transferred electron effect? In which type of material it is present? Explain the principle of construction, function of IMPATT diode, and list their applications.	20	CO3

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SECTION A

S. No.		Marks	CO
1.	What are the limitations of conventional tubes at microwave frequencies?	5	CO1
2.	Differentiate between two cavity klystron and reflex Klystron.	5	CO3
3.	Spell out the following abbreviated terms: IMPATT, TRAPATT BARITT, LSA, InP and CdTe.	5	CO2
4.	How are microwave measurement techniques different from low frequency measurement?	5	CO4
	SECTION B		
5.	Double minimum method is used to determine the VSWR value on a waveguide. If the separation between the two adjacent minima in 3.5 cm & that between twice of minimum power points is 2.5 mm. Determine the value of VSWR.	10	CO5
6.	A reflex Klystron operates at the peak mode of n=2 with Beam Voltage: V0 = 300 V Beam Current: I0 =20 mA Signal Voltage: V1= 40V Determine: a. The input power in watts b. The output power in watts c. The efficiency	10	CO3
7.	Explain working of TWT with neat sketch.	10	CO4
8.	Name microwave devices, which make use of Faraday rotation. Explain the construction and working of any one of them.	10	CO2
	SECTION-C		
9.	Draw the schematic diagram of a cylindrical magnetron oscillator and explain its Action. . Obtain Hull cut off magnetic equation and cut off voltage for cylindrical magnetron. An X band pulsed cylindrical magnetron has the following operating parameters. Anode voltage Vo = 26 K volts, Beam current I_o = 27 A, Magnetic flux density Bo = 0.336 wb/m^2. Radius of cathode cylinder a = 5 cms, Radius of vane edge to center = b = 10 cms, compute the : (i) cyclotron angular frequency (ii) Cutoff voltage for a fixed Bo (iii) The cut off magnetic flux density	20	CO4
10.	Write in brief, what is transferred electron effect? In which type of material it is present? What are the typical characteristics of Gunn diode and explain its working as oscillator. or Draw a neat diagram of TRAPATT diode; explain the principle of operation with neat figures. Avalanche zone velocity of a TRAPATT diode has following parameters. Doping concentration NA = 2.1015 cm-3, current density J = 20 KA/cm2. Calculate the avalanche-zone velocity.	20	CO3