

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Programme: B.Tech EE
Course Name: Microwave Engineering
Course Code: ELEG415

Semester – VI
Max. Marks: 100
Time : 3 Hrs

Instructions: All questions are compulsory.

SECTION A

S. No.		Marks	CO
Q1	Explain Gunn effect.	5	CO3
Q2	State and prove kurodas fourth identity.	5	CO2
Q3	Explain the working of realization of four port circulator using two magic TEE's and 180 deg phase shifter.	5	CO2
Q4	Rectangular wave guide is said to support dominant mode with cutoff frequency of 2 GHz. Find the dimensions of the waveguide. Also determine guided wavelength, phase velocity, phase constant and guided impedance if the operating frequency is $1.5f_c$.	5	CO1

SECTION B

Q 5	Discuss the working of two cavity klystron amplifier and derive expression for the efficiency of above amplifier starting from basic principles.	8	CO1
Q6	Derive the field expressions for TM modes in cylindrical wave guide.	8	CO3
Q7	Explain with neat sketch the working of Network analyzer and how it is used to measure the attenuation constant and return loss.	8	CO2
Q8	With neat energy band diagram, explain Ridley-Watkins-Hilsum (RWH) theory in GUNN diode.	8	CO3
Q9	A TWT operates under the following parameters: Beam Voltage $V_0=3KV$, Beam current $I_0=30mA$, characteristic impedance of helix $Z_0=10\Omega$, circuit length $N=50$, Operating Frequency= $10GHz$. Determine (i) The gain parameter C. (ii) The output power gain A_p in dB. Or A rectangular waveguide has inner dimensions of 4 cm x 6 cm. When the waveguide is terminated in unknown load impedance, the distance measured between a node and next antinode is found to be 4.55 cm, for the dominant mode. Find the frequency of the transmitted wave signal.	8	CO4 CO1

SECTION-C

Q10	(a) Design stepped impedance LPF with maximally flat response response with $N=6$. Center frequency is 2.5 GHz, highest practical line impedance is 120 ohms	20	CO4
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	<p>and the lowest line impedance is 20 ohms. Realize the filter with RT-Duriod 5880 substrate. $(g_1 = g_6 = 0.517, g_2 = g_5 = 1.414, g_3 = g_4 = 1.932)$ (15) (b) An isolator having the return loss of -35dB and isolation of -60dB, find the S-Parameter.(5)</p>		
Q11	<p>A Reflex klystron operates under the following conditions: $V_o = 600$ V, $L = 1$ mm, $R_{sh} = 15$ KΩ $f = 9$ GHz, $e/m = 1.759 \times 10^{11}$. The tube is operating at f_r at the peak of the $n = 2$ mode or $3\frac{1}{4}$ mode. The transit time through the gap and beam loading can be neglected. (i) Find the value of repeller voltage V_r. (ii) Find the direct current necessary to give a microwave gap voltage of 200V. (iii) What is the electronic efficiency</p> <p style="text-align: center;">Or</p> <p>An X band pulsed cylindrical magnetron has the following operating parameters. Anode voltage $V_o = 26$ K volts, Beam current $I_o = 27$ A, Magnetic flux density $B_o = 0.336$ wb/m². Radius of cathode cylinder $a = 5$ cms, Radius of vane edge to center = $b = 10$ cms, compute the (i) cyclotron angular ω (ii) Cut off voltage for a fixed B_o (iii) The cut off magnetic flux density</p>	20	CO5