Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2020

Programme Name: B. Tech (ECE) **Semester : V**
Course Name : Microwave theory & Techniques **Time : 03 hrs**
Course Code : ECEG 3034 **Max. Marks : 100**
Nos. of page(s) : 02
Instructions: **All Questions are Compulsory.**

SECTION A (6x5=30)

S. No.		Marks	CO
Q 1	An X-band Pulsed cylindrical magnetron has the following parameters: Anode voltage (V0) =32 KV Anode Current (I0)=84 amp Magnetic flux density B0=0.01 Wb/sq.m Radius of cathode cylinder (a)=6 cm Radius of anode (b)=12 cm. Compute: Cyclotron angular frequency Cutoff Voltage for fixed B0. Cutoff Magnetic flux density for fixed V0.	**5**	**CO3**
Q 2	Twocavity klystron amplifier has the following parameters: Beam Voltage (V_0)=20 KV Beam Current (I_0)=1.5 amp Operating Frequency =2 GHz; input & output beam Coupling Co-eff =1 Signal voltage (V_1)=2V (rms) Dc electron charge density =10^{-6} c/m^3 Cavity shunt resistance (R_{sh}) =2 KΩ Total Shunt resistance including load(R_{shl}) =1 KΩ., Reduction factor (R) =0.4 Determine plasma frequency, induced voltage in the output cavity, power delivered to the load, electronic efficiency.	**5**	**CO3**

Q 3	Using double minima method it is observed that the variations in 3 dB points is 0.001. Distance between the two consecutive minima locations is d1 =4.6 cm and d2 =8.95cm from the load. Find SWR, reflection coeff and find the load impedance if characteristic impedance of the line is 75 ohms.	**5**	**CO5**
Q 4	TE_{21} mode is propagating through a rectangular waveguide having the diameter of 3cm and 1 cm as 'a & b' respectively.. Guide is filled with air dielectric. Find fc, λg and Zg in the guide for an operating frequency of 4 GHz.	**5**	**CO1**
Q5.	Given g1=g5=0.618; g2=g4=1.618, g3 =2.0, cutoff frequency =3 GHz, signal freq =4 GHz, Δ =10%. Design BSF using lumped elements	**5**	**CO2**
Q6.	Explain the working of network analyzer	**5**	**CO5**
	SECTION B (5x10=50)		
Q 7	Derive the attenuation factor for TM modes in rectangular waveguide.	**10**	**CO1**
Q 8	Explain Two valley model. What are the various modes of Oscillations of GUNN diode	**10**	**CO4**
Q 9	Derive the Hartree voltage in case of linear magnetron.	**10**	**CO3**
Q 10	Explain the working of BLC, Hybrid ring, power divider, Magic TEE.	**10**	**CO2**
Q11	Derive the field expressions for TE mnl modes of rectangular cavity.	**10**	**CO1**
	SECTION-C (1x20=20)		
Q12.	GaAs FET has the following Scattering and Noise parameters at 8 GHz.(Z_0=50 ohms), S_{11}=0.7(-110 deg), S_{12}=0.02(60 deg), S_{21} =3.5(60 deg) and S_{22}=0.8 (-70 deg). Fmin=2.5 dB, Optimum reflection coeff (Γopt=0.7(120 deg)). Design Low noise Amplifier with minimum noise figure, maximum possible gain with matching circuits using shunt stubs.	**20**	**CO2**

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