Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, July 2020

Course: Microwave Engineering **Semester: VI**
Program: B.Tech ASE+AVE **Time 03 hrs.**
Course Code: ECEG 4003 **Max. Marks: 100**

Instructions:

1. **Read the Instruction carefully before attempting**
2. **For Theory based : Type the Answers in word file**
3. **For Figures if any : Draw a free hand sketch and insert the same word file**
4. **For Numerical : Solve it in a paper and insert in the same word file**
5. **Upload as a single word file for all the Question in Blackboard.**

Note : Please upload the word document only, Do not upload PDF and or other format. The answer scripts will be considered for evaluation only through Blackboard. No other mode of submission is acceptable.

SECTION A [Case Based Study] 60 Marks

S. No.		Marks	CO
Q 1	A transmission line is used for the transmission of electrical power from generating substation to the various distribution units. It transmits the wave of voltage and current from one end to another. The transmission line is made up of a conductor having a uniform cross-section along the line. Air act as an insulating or dielectric medium between the conductors. a) Design the equivalent circuit diagram for the general transmission lines. b) Derive the general differential equations for the voltage and current flows across the parallel wire microwave lines. c) What is the general solution for the transmission line terminated at load? In addition, derive the voltage and current values with the application of initial and final boundary conditions. d) Derive source impedance with open and short circuit conditions.	**25**	**CO2**
Q 2	Discuss the relationship for antenna power gain and directivity. How the aperture area of an antenna is useful while describing the field of view for the microwave transmission. Discuss the different apertures used and correlate the relationships.	**15**	**CO 1**
Q 3	A traveling wave tube (TWT) is an electron device used for radio-frequency amplification at microwave frequencies (above 500 MHz) and is the primary means	**20**	**CO 4**

NOTE : The submission time of the Question Paper Answer Sheet is 24 Hhrs from the scheduled time (*exceptional provision due to extraordinary circumstance due to COVID-19 and due to internet connectivity issues in the far-flung areas*).
No Submission will be entertained after 24 Hrs

	of signal amplification utilized in communication satellites. TWTs are also used for ground broadcast stations, guidance systems and military aircraft radar. TWTs convert DC power to radio-frequency power by synchronizing the radio-frequency wave with an electron beam traveling in a vacuum. a) What is the fundamental principle of TWT used for the defense applications b) Discuss the working, advantages and disadvantages c) Describe the various applications		
SECTION B [Numerical and Short Answers] 40 Marks			
Q 4	Calculate the characteristic impedance propagation constant and velocity of propagation at 400kc/s for a transmission line having L=0.5mH/km, C=0.08microF and negligible R and G.	**10**	**CO3**
Q5	With the schematic diagram, explain the fundamental principle and working of magnetron microwave devices.	**5**	**CO4**
Q 6	A parabolic reflector antenna has circular cross-section with a diameter of 1.22m. If the maximum effective aperture is 60% of the physical aperture, calculate the directivity of the antenna at 18 GHz.	**5**	**CO 1**
Q 7	An R.F line of characteristics impedance 600ohms is terminated in an impedance of (400+j200) ohms. Calculate the VSWR	**5**	**CO 2**
Q 8	Derive the relationship for cut-off wavelength and the guide wavelength for the microwave propagation.	**5**	**CO 3**
Q 9	An air filled hollow rectangular conducting waveguide has cross-section of 8x10cm. How many TE mode will this waveguide transmit at frequencies below 4GHz. How these modes are designated and their cut-off frequencies.	**10**	**CO 3**

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