Enrolment No:

UPES
UNIVERSITY WITH A PURPOSE

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

Course: Antenna theory & wave propagation   **Semester: VI**
Program: B.Tech electronics and communication engineering /   **Time 03 hrs.**
Course Code: ECEG 3008   **Max. Marks: 100**

Instructions:

1. **Attempt all the questions (Theory, Numerical, Case study etc.) on A4 size blank sheets.**
2. **Attempt all questions serially as per question paper.**
3. **Answer should be neat and clean. Draw a free hand sketch for circuits/tables/schematics wherever required.**
4. **Scan the whole answer script and check the resolution carefully before upload on the blackboard. Note that answer scripts will be considered for evaluation only through Blackboard. No other mode of submission is acceptable.**
5. **You are expected to be honest about each attempt which you make to progress in life**

S. No.	SECTION A [Case Based Study/design] 40 Marks (Answer any two)	Marks	CO
Q 1	Derive the expression for fields radiated by infinitesimal dipole. Calculate the radiation resistance of an antenna of length $\lambda/200$. Calculate the directivity of infinitesimal dipole antenna.	**20**	**CO1**
Q 2	Derive the fields radiated by E-plane sectoral horn antenna.	**20**	**CO4**
Q 3	a) Design the microstrip patch operating at 3 GHz and realize the patch with dielectric material of relative permittivity $\epsilon r=2.2$, h=0.762 mm.	**10**	**CO4**
	b) Design the Dolph Tchebyschev antenna of 6 elements with spacing $\lambda/2$ to optimize the required SLL of 26 dB down the main lobe maxima.	**10**	**CO3**
	SECTION B [Numerical and Short/broad Answers] 60 Marks (Answer any Six)		
Q4	Prove that $D=(4\pi/\lambda^2)Ae$	**10**	**CO2**
Q5	Define Gain, Directivity, Radiation intensity. Explain Field equivalence principle.	**10**	**CO2**
Q6	Derive the expression for array factor of N-element linear array with uniform excitation and spacing between the elements.	**10**	**CO3**

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

Q7	Prove that $\mu = \text{Sqrt}(1-81N/f^2)$	10	CO5
Q8.	Derive the expression for the following: Critical frequency, Maximum usable frequency and skip distance.	10	CO5
Q9	a).Derive the expression for field strength received by the signal after propagation through troposphere by LOS.	5	CO5
Q9	b).Design and deduce the expression for array factor of binomial array of 6 elements with spacing between the elements of $\lambda/2$.	5	CO3
Q10	a)Given $E= \cos(\pi/4(\cos\theta-1))e\text{-}j\beta r/r$. Find Directivity.	5	CO2
	b).Design Yagi Uda antenna operating at 850 MHz with 7 elements.	5	CO4

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