UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2021

Course: Antenna & Wave Propagation   Semester: VI
Program: B.Tech (ECE)   Time 03 hrs.
Course Code: ECEG 3008   Max. Marks: 100

Instructions: Attempt ALL Questions

SECTION A (6x5=30 marks)

S. No.		Marks	CO
Q 1	Given radiation intensity $U = U_0 \sin\theta \sin^3\emptyset$ where θ and $\emptyset$ are in the range of 0 to π. Find directivity.	5	CO1
Q2	Derive Friss transmission formula	5	CO1
Q3	Prove that $R=(4/3)a$ where a is the actual radius of earth.	5	CO5
Q4	Calculate the FNBW, HPBW and gain of parabolic reflector antenna with diameter of 4λ operating at 5 GHz.	5	CO3
Q5	Design a binomial array of 6 elements and find an array factor. Spacing between the elements is $\lambda/2$.	5	CO2
Q6.	How will you measure the gain of the antenna.	5	CO4

SECTION B

Q7.	Design the microstrip patch antenna operating at 10 GHz. Realize the structure with RT-Duriod 5880 substrate($e_r=2.2$, h=0.762mm).	10	CO3
Q8	Design Doph-Tchebyschev array of 6 elements which are in phase with each other and spaced $\lambda/2$ apart is desired to have SLL 26dB down the main lobe maxima. Find HPBW and approximate Directivity.	10	CO2
Q9	Design five turn helical antenna to operate at 500 MHz in axial mode. Find the terminal impedance, axial ratio, circumference of the helix, overall length of the helix and the directivity of the antenna with the spacing between the turns is $\lambda/10$.	10	CO3
Q10	Derive Lorentz-gauze condition. Explain retarded potential.	10	CO1
Q11	a)Ionic concentration in the layer varies as $N(h)=(20h^2+14h+40)\times10^{21}$ electronics/m^3 Find Critical frequency, Maximum usable frequency, skip distance for the F-layer. b). Calculate the power received by receiver antenna having the height of 4 Km from the ground if the transmitter antenna is kept at a height of 4.5 km from the ground. It	10	CO5

	is expected that system is under LOS and the distance between the txer and rxer is radio horizon. Gain of both antennas is 7dB each and power transmitted is of 1 mw. Frequency of operation is at 5 GHz.. Deduce the expression for radio horizon.		
	SECTION-C (Answer any two) **2x20 =40**		
Q12	Derive the field expressions for Microstrip patch antenna using cavity model	**20**	**CO3**