KUMARAGURU
college of technology
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Register Number:……

M.TECH DEGREE EXAMINATIONS: NOV/DEC 2024

(Regulation 2018)

Second Semester

DEFENCE TECHNOLOGY

P18DTT2018**:** Digital and Satellite Communication and Navigation from Space

COURSE OUTCOMES

CO1: Understand the communication techniques

CO2: Evaluate the performance of communication systems

CO3: Design the analog and digital communication systems

CO4: Understand and analyse the signal transmission effects

CO5: Understand the different types of communication techniques

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions: -

PART A (10 x 1 = 10 Marks)

1.	Which of the following represent ionospheric layers?			CO2	[K_2]
	a)	D, E and P	b) A, B and C		
	c)	A, B and K	d) D, E, F1 and F2		
2.	Free Space Optical *(FSO)* communication is carried out using			CO1	[K_2]
	a)	Laser beams	b) Radio waves		
	c)	Microwaves	d) Acoustic waves		
3.	Space waves are used for…..			CO5	[K_1]
	a)	Terrestrial communication	b) Underwater communication		
	c)	Fiber optic communication	d) Communications beyond Earth's atmosphere		
4.	When charged particle having a velocity experiences external magnetic field at 90^O,			CO1	[K_1]
	a)	There is no change in its motion	b) It undergoes spiral motion		
	c)	It undergoes helical motion	d) It undergoes circular motion		
5.	Analog amplitude modulation has			CO1	[K_1]
	a)	Very noisy reception	b) Smooth reception		
	c)	No reception	d) Unpredictable reception		
6.	In Spherical Polar Coordinates, azimuth angle is..			CO3	[K_1]

a) the angle between x axis and y axis
b) the angle between position vector and z-axis
c) the angle from x-axis in the x-y plane varying between + π to - π
d) Always π/2

7. In the Poynting vector notation, *u* stands for — CO4 — [K_1]
a) Power per unit area
b) Energy per unit volume
c) Electric current
d) Magnetic field

8. GPS satellites are generally placed in — CO4 — [K_1]
a) Geosynchronous Low Earth Orbit
b) Geosynchronous High Earth Orbit
c) Geosynchronous Polar Orbit
d) Near Earth Orbit

9. In fiber optic communication utilizes the following principle — CO2 — [K_2]
a) Total Radiation Reflection
b) Total Internal Reflection
c) No Internal Reflection
d) Total Transmission

10. When electromagnetic waves travels from one medium to another medium, which of the following remains unchanged? — CO3 — [K_2]
a) Wavelength
b) Amplitude
c) Frequency
d) Velocity

PART B (10 x 2 = 20 Marks)

11.	Explain amplitude and time shifted signal with appropriate diagrams.	CO1	[K_2]
12.	Describe the properties of electromagnetic wave.	CO3	[K_2]
13.	Write down the expression for the power received by a free space optical terminal.	CO4	[K_2]
14.	Write down expression for a displacement vector in cylindrical coordinate system.	CO4	[K_2]
15.	Write the effect of noise on reliable communication.	CO1	[K_2]
16.	Write down the mathematical expressions for electric and magnetic field components of electromagnetic wave in complex notations.	CO5	[K_2]
17.	Explain in short about Forward Error Correcting (FEC) codes.	CO5	[K_2]
18.	Discuss principal radiation pattern of antenna with appropriate diagram.	CO2	[K_2]
19.	A signal is received at a distance r from a transmitter and the received power drops off as $1/r^2$. When r = 1 km, 200 nW is received. What is r when the received power is 200 fW ?	CO4	[K_2]
20.	Write down a mathematical expression for radiation pressure. How does it affect satellites/spacecrafts orbiting around Earth?	CO5	[K_2]

PART C (6 x 5 = 30 Marks)

21.	Explain in brief Phase Shift Keying. Discuss about Binary Phase Shift Keying.	COL	[K_L]
22.	Discuss antenna directivity, gain and efficiency.	COL	[K_L]
23.	Write down the benefits of free space optical communications.	COL	[K_L]
24.	Write a note on single and multimode fibers.	COL	[K_L]
25.	For amplitude and phase spectrum of a signal in time domain, describe the difference between discrete and continuous spectrum for both.	COL	[K_L]
26.	Write a note on GPS signals.	COL	[K_L]

Answer any FOUR Questions

PART D (4 x 10 = 40 Marks)

27.	a) Derive the equation of wave motion for a stretched string under tension T.	CO3	[K_3]
	b) Calculate the numerical aperture, acceptance angle for the optical fiber for n1(core) = 1.8 and n2(cladding) = 1.4	CO4	[K_2]
28.	For a navigational satellite, explain the concept of Code and Phase Pseudorange Measurements. Outline the sources of observable errors in these measurements.	CO5	[K_4]
29.	Derive the expression for retarded potential for oscillating electric dipole along with approximation for d<<r. Write down the expressions for vector potential, its electric field and magnetic field.	CO3	[K_3]
30.	Using Maxwell's equations, describe electromagnetic waves in vacuum and show that electric and magnetic field components satisfy the equation of wave motion.	CO5	[K_2]
31.	Discuss the applications of NAVIC.	CO5	[K_4]

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