18ECE301T202J – Wireless Communication

Name		Unit No.	II
Designation / Department		Unit Title	

Notations

M - Marks
CO - Course Learning Outcome
BL - Bloom's Level (1. Remembering | 2. Understanding | 3. Applying | 4. Analysing | 5. Evaluating | 6. Creating)
PI - Performance Indicator Code

Note

1. Refer appendix / attachment for Bloom's Taxonomy action verbs
2. Refer appendix / attachment for a model Performance Indicator
3. For each unit / CO, write 20 MCQs (10 questions in Level 1 & 2; 6 or 7 questions in Level 3; 3 or 4 questions in Level 4)
4. Both higher order cognitive skills 'Evaluate' and 'Create' are difficult to assess in time-limited examinations, and hence no questions may not be set up in Levels 5 & 6.
5. Fill up the table of CO / Bloom's Level distribution given at the end of this document.

Q. No.	MCQ		M	CO	BL	PI
1.	Identify the propagation model that predicts the mean signal strength for an arbitrary Transmitter – Receiver (T-R) separation distance.		1	2	1	
	A.	Small scale				
	B.	Mid scale				
	C.	Large scale				
	D.	Low scale				
	Ans.	C				
2.	Frii's free space equation is		1	2	1	
	A.	$P_r(d) = (P_tG_tG_r\lambda)/(16\pi d^2L)$				
	B.	$P_r(d) = (P_tG_tG_r\lambda)/(16\pi^2d^2L)$				
	C.	$P_r(d) = (P_tG_tG_r)/(16\pi d^2L\,\lambda^2)$				
	D.	$P_r(d) = (P_tG_tG_r)/(16\pi d^2L\,\lambda^{-2})$				

	Ans.	D				
3.	The gain of an antenna (G) is related to its effective aperture (A_e) by		1	2	1,2	
	A.	$G = (4\pi \lambda^2)/A_e$				
	B.	$G = (4\pi A_e)/ \lambda^2$				
	C.	$G = A_e /(4\pi \lambda^2)$				
	D.	$G = (4 \pi^2 A_e)/ \lambda^2$				
	Ans.	B				
4.	The effective isotropic radiated power (EIRP) is		1	2	1,2	
	A.	$EIRP = P_r G_t$				
	B.	$EIRP = P_r/G_t$				
	C.	$EIRP = P_t/G_r$				
	D.	$EIRP = P_t G_t$				
	Ans.	D				
5.	Find the far – field distance for an antenna with maximum dimension of 2 m and operating frequency of 1000 MHz		2	2	3	
	A.	20.64 m				
	B.	26.64 m				
	C.	22.64 m				
	D.	28.64 m				
	Ans.	B				

6.	If a transmitter produces 50 W of power, expres the transmit power in units of dBm and dBw		2	2	3	
	A.	47 and 17				
	B.	17 and 47				
	C.	37 and 12.5				
	D.	27 and 15				
	Ans.	A				
7.	If 25 W is applied to a unity gain antenna with a 1000 MHz carrier frequency, find the received power in dBm at a free space distance of 50 m from the antenna. What is P_r(10 km)? Assume unity gain for the receiver antenna		2	2	3,4	
	A.	1.425 mW				
	B.	1.425 W				
	C.	1.425 µW				
	D.	1.425 nW				
	Ans.	C				
8.	____ occurs when a propagating electromagnetic wave impinges upon an object which has very large dimensions when compared to the wavelength of the propagating wave		1	2	1	
	A.	Refraction				
	B.	Reflection				
	C.	Diffraction				
	D.	Scattering				
	Ans.	B				

9.	______ occurs when the radio path between the transmitter and receiver is obstructed by a surface that has sharp irregularities.		1	2	1	
	A.	Diffraction				
	B.	Scattering				
	C.	Refraction				
	D.	Reflection				
	Ans.	A				
10.	Calculate the Brewster angle for a wave impinging on ground having a permittivity of $\varepsilon_r = 5$.		2	2	3	
	A.	21.09				
	B.	22.09				
	C.	23.09				
	D.	24.09				
	Ans.	D				
11.	The angle at which no reflection occurs in the medium of origin is known as		1	2	1,2	
	A.	Incident angle				
	B.	Reflection angle				
	C.	Critical angle				
	D.	Brewster angle				
	Ans.	D				
12.	The received power at a distance 'd' from the transmitter for the two ray ground bounce model can be expressed as		2	2	2	
	A.	$P_r = (P_tG_tG_rd^2)/(h_t^2\ h_r^2)$				
	B.	$P_r = (P_tG_tG_r)/(h_t^2\ h_r^2\ d^2)$				
	C.	$P_r = (P_tG_tG_r)/(h_t^2\ h_r^2\ d^4)$				

	D.	$P_r = (P_t G_t G_r\ d^4)/(h_t^2\ h_r^2)$				
	Ans.	C				
13.	A mobile is located 10 km away from a base station and uses a vertical $\lambda/4$ monopole antenna with a gain of 2.55 dB to receive cellular radio signals. The E field at 1 km from the transmitter is measured to be 10^{-3} V/m. The carrier frequency used for this system is 900 MHz, calculate the length of the receiving antenna.		2	2	3,4	
	A.	0.0523 m				
	B.	0.064 m				
	C.	0.075 m				
	D.	0.083 m				
	Ans.	D				
14.	A mobile is located 10 km away from a base station and uses a vertical $\lambda/4$ monopole antenna with a gain of 2.55 dB to receive cellular radio signals. The E field at 1 km from the transmitter is measured to be 10^{-3} V/m. The carrier frequency used for this system is 900 MHz. Find the received power at the mobile using the two ray ground reflection model assuming the height of the transmitting antenna is 50 m and the receiving antenna is 3 m above the ground.		2	2	3,4	
	A.	566.05 V/m				
	B.	566.05×10^{-3} V/m				
	C.	566.05×10^{-6} V/m				
	D.	566.05×10^{-9} V/m				
	Ans.	C				
15.	The fraunhofer distance is given by		1	2	1	
	A.	$d_f = (2\ D^2)/\ \lambda^2$				
	B.	$d_f = (2\ D)^2/\ \lambda^2$				

	C.	$d_f = (2\,D^2)/\,\lambda$				
	D.	$d_f = (2\,D)/\,\lambda^2$				
	Ans.	C				
16.	The path loss exponent 'n' value for free space is		1	2	1	
	A.	1				
	B.	1.5				
	C.	2				
	D.	3				
	Ans.	B				
17.	Okumura model found that the value of $G(h_{te})$ varies at a rate of _____ dB/decade and $G(h_{re})$ varies at a rate of ____ dB/decade for heights less than 3 m.		1	2	2	
	A.	10 and 20				
	B.	15 and 30				
	C.	20 and 10				
	D.	30 and 15				
	Ans.	C				
18.	An antenna with maximum dimension of 1 m and operating frequency of 800 MHz. Calculate the Fraunhofer distance		2	2	3	
	A.	4.33 m				
	B.	4.33 cm				
	C.	5.33 cm				
	D.	5.33 m				
	Ans.	D				

19.	According to laws of reflection in dielectrics the following is correct.		1	2	2	
	A.	$\theta_i = \theta_r$				
	B.	$\theta_i > \theta_r$				
	C.	$\theta_i < \theta_r$				
	D.	$\theta_i = 2\theta_r$				
	Ans.	A				
20.	Which one is not correct regarding the Okumura model		1	2	1	
	A.	Simplest model				
	B.	Best in accuracy for mature cellular path loss prediction				
	C.	Model is not good at rural areas				
	D.	Slow response to rapid changes in terrain				
	Ans.	C				
21.	The path loss for the two-ray model can be expressed in dB as		1	2	2	
	A.	**PL(dB) = 40logd-10logG_t+10logG_r+20logh_t+20logh_r**				
	B.	**PL(dB) = 40logd-10logG_t-10logG_r+20logh_t+20logh_r**				
	C.	**PL(dB) = 40logd-(10logG_t+10logG_r+20logh_t)+20logh_r**				
	D.	**PL(dB) = 40logd-(10logG_t+10logG_r+20logh_t+20logh_r)**				
	Ans.	D				
22.	Calculate the median path loss using Okumara's model for d = 50 km, h_{te} = 100 m, h_{re} = 10 m in a suburban environment. If the base station transmitter radiates an EIRP of 1 KW at a carrier frequency of 900 MHz.		2	2	3,4	
	A.	-120.5 dB				
	B.	-122.5 dB				
	C.	-125.5 dB				

	D.	-130.5 dB				
	Ans.	C				
23.	Okumara model can be used for base station antenna heights ranging from ____ to ____ m.		1	2	1	
	A.	5, 10				
	B.	10, 15				
	C.	15, 25				
	D.	30, 1000				
	Ans.	D				
24.	The pathloss equation of Hata model for a suburban area is		1	2	2	
	A.	$L_{50}(dB) = L_{50}(urban) + 2[\log(f_c/28)]^2 + 5.4$				
	B.	$L_{50}(dB) = L_{50}(urban) - 2[\log(f_c/28)]^2 - 5.4$				
	C.	$L_{50}(dB) = L_{50}(urban) - 2[\log(f_c/28)] - 5.4$				
	D.	$L_{50}(dB) = L_{50}(urban) + 2[\log(f_c/28)] + 5.4$				
	Ans.	C				
25.	______ Model uses diffraction to predict average signal strength at street level.		1	2	1	
	A.	Okumara				
	B.	Walfisch and Bertoni				
	C.	Hata				
	D.	Durkin's				
	Ans.	B				
26.	The free space path loss between the isotropic antennas is given by		1	2	1	
	A.	$P_0 = \lambda/4\pi R$				

	B.	$P_0 = \lambda^2/4\pi R^2$				
	C.	$P_0 = \lambda^2/4\pi^2 R^2$				
	D.	$P_0 = \lambda^2/(4\pi R)^2$				
	Ans.	D				
27.	A special case of the piecewise model is _____ model		1	2	1	
	A.	Durkin's				
	B.	Okumara				
	C.	Dual slope				
	D.	Hata				
	Ans.	C				
28.	The free space model predicts that received signal decays as a function of __________		1	2	1	
	A.	Gain of transmitter antenna				
	B.	T-R separation				
	C.	Power of transmitter antenna				
	D.	Effective aperture of the antenna				
	Ans.	B				
29.	Antenna's efficiency is given by the ratio of ___________		1	2	1	
	A.	Losses				
	B.	Physical aperture to effective aperture				
	C.	Signal power to noise power				
	D.	Effective aperture to physical aperture				
	Ans.	D				
30.	Longley-Rice prediction model is also referred as _________		1	2	1	

	A.	Okumura model				
	B.	Hata model				
	C.	ITS irregular terrain model				
	D.	Bertoni model				
	Ans.	C				
31.	Which method is used by Edwards and Durkin algorithm to calculate the loss associated with diffraction edges?		1	2	1	
	A.	Epstein and Peterson method				
	B.	Interpolation method				
	C.	Knife edge diffraction method				
	D.	Fresnel- Kirchoff method				
	Ans.	A				
32.	The Hata model is empirical formulation of which model?		1	2	1	
	A.	Okumura model				
	B.	Longley- Rice model				
	C.	Durkin's model				
	D.	Walfisch and Bertoni model				
	Ans.	A				
33.	Relation between gain and effective aperture is given by _______		1	2	2	
	A.	$G=(4\pi A_e)/\lambda^2$				
	B.	$G=(4\pi \lambda^2)/A_e$				
	C.	$G=4\pi A_e$				
	D.	$G=A_e/\lambda^2$				
	Ans.	A				
34.	Path loss in free space model is defined as difference of _________		1	2	1	

	A.	Effective transmitted power and gain				
	B.	Effective received power and distance between T-R				
	C.	Gain and received power				
	D.	Effective transmitter power and receiver power				
	Ans.	D				
35.	Log normal shadowing implies that measured signal levels at specific T-R separation have ______ distribution when signal levels have values in dB units.		1	2	2	
	A.	Rayleigh				
	B.	Gamma				
	C.	Gaussian				
	D.	Nakagami				
	Ans.	C				
36.	Diffraction is caused by propagation of secondary wavelets into _______		1	2	1	
	A.	Bright region				
	B.	Shadowed region				
	C.	Smooth region				
	D.	Large region				
	Ans.	B				
37.	Okumura model is applicable for distances of _________		1	2	1	
	A.	1 m to 10 m				
	B.	1 km to 100 km				
	C.	100 km to 1000 km				
	D.	10 km to 10000 km				
	Ans.	B				
38.	What does path loss exponent indicates?		2	2	2	

	A.	Rate at which path loss decreases with distance				
	B.	Rate at which path loss increases with distance				
	C.	Rate at which path loss decreases with power density				
	D.	Rate at which path loss increases with power density				
	Ans.	B				
39.	Which distribution describes the shadowing effect?		1	2	1	
	A.	Log normal distribution				
	B.	Nakagami distribution				
	C.	Cauchy distribution				
	D.	Rayleigh distribution				
	Ans.	A				
40.	Propagation model that characterize rapid fluctuation is called __________		1	2	1	
	A.	Hata model				
	B.	Fading model				
	C.	Large scale propagation model				
	D.	Okumura model				
	Ans.	B				

Course Outcome and Bloom’s Level Distribution to the questions

Question No.	Course Outcome Distribution					BL Distribution					
	CLO-1	CLO-2	CLO-3	CLO-4	CLO-5	L1	L2	L3	L4	L5	L6
1		✓			□	✓	□	□	□		
2		✓			□	✓	□				
3		✓			□	✓	✓				
4		✓			□	✓	✓				

5		✓			□	□	□	✓	□		
6		✓			□	□	□	✓			
7		✓			□	□	□	✓	✓		
8		✓			□	✓	□				
9		✓			□	✓	□				
10		✓			□	□	□	✓			
11		✓			□	✓	✓				
12		✓			□	□	✓	□	□		
13		✓			□	□	□	✓	✓		
14		✓			□	□	□	✓	✓		
15		✓			□	✓	□				
16		✓			□	✓	□				
17		✓			□	□	✓				
18		✓			□	□	□	✓			
19		✓			□	□	✓				
20		✓			□	✓	□				
21		✓			□	□	✓				
22		✓			□	□	□	✓	✓		
23		✓			□	✓	□				
24		✓			□	□	✓				
25		✓			□	✓	□				
26		✓			□	✓	□				
27		✓			□	✓	□				
28		✓			□	✓	□				
29		✓			□	✓	□				
30		✓			□	✓	□				
31		✓			□	✓	□				
32		✓			□	✓	□				
33		✓			□	□	✓				
34		✓			□	✓	□				
35		✓			□	✓	✓				
36		✓			□	✓	□				
37		✓			□	✓	□				
38		✓			□	✓	□				
39		✓			□	✓	□				
40		✓			□	✓	□				
Total					40	□	□				
%											