



INSTITUTE OF INFORMATION TECHNOLOGY
JAHANGIRNAGAR UNIVERSITY
4TH YEAR 2ND SEMESTER FINAL EXAMINATION-2020

COURSE CODE: IT-4203

COURSE TITLE: WIRELESS AND MOBILE COMMUNICATIONS

TOTAL MARKS: 60

TIMES: 3 HOURS

ANSWER ANY FIVE (5) QUESTIONS

1. a) Mention the main limitation of reservation-based multiple access technique. Comparing this limitation explain the statement "Random multiple access is more efficient" 4
b) "FDMA wastes bandwidth", How? Explain. Do you agree "TDMA is a complimentary access technique to FDMA"? If you agree then show your logic. 4
c) In the GSM800 digital channelized cellular system, the one-way bandwidth of the system is 12.5 MHz. The RF channel spacing is 200 kHz. Eight users share each RF channel and three channels per cell are used for control channels. Calculate the spectral efficiency of modulation (for a dense metropolitan area with small cells) using the following parameters:
 - Area of a cell = 8 km²
 - Total coverage area = 4000 km²
 - Average number of calls per user during the busy hour = 1.2
 - Average holding time of a call = 100 seconds
 - Call blocking probability = 3%
 - Frequency reuse factor = 7
2. a) Explain Spread Spectrum System with block diagram. Do you agree "CDMA is a Direct Sequence Spread Spectrum system"? If you agree then explain showing your logic. 4
b) What is linear-feedback shift register? Draw a 16-bit Fibonacci LFSR. If the seed is 1010110011100000. Find the pseudo-noise sequences for four rounds. 4
c) Calculate the capacity and spectral efficiency of the DS-SS system with an omnidirectional cell using the following data:
 - bandwidth efficiency $\eta_b = 0.9$
 - frequency reuse efficiency $\eta_f = 0.45$
 - capacity degradation factor $c_d = 0.8$
 - voice activity factor $v_f = 0.4$
 - information bit rate $R = 16.2$ kbps
 - $E_b/N_0 = 7$ dB
 - one-way system bandwidth $B_w = 12.5$ MHzNeglect other sources of interference.
3. a) Describe the ground reflection model and find the path difference and phase difference between two waves using this model. 7
b) A mobile is located 5 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. 5
 - i) Find the length and the effective aperture of the receiving antenna.
 - ii) 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 1.5 m above ground.

4. a) What does mean by frequency reuse? How is the frequency reuse use in cellular communication? Explain. 4
 b) Briefly discuss the co-channel and adjacent channel interference in cellular communication. 4
 c) Prove that for a hexagonal geometry, the co-channel reuse ratio is given by $Q = \sqrt{3}N$, 4
 where $N = i^2 + ij + j^2$.

5. a) Explain the condition for various types of small-scale fading used in wireless communications 3
 b) Assuming the speed of a vehicle is equal to 60 mph (88ft/sec), carrier frequency, $f_c = 860$ MHz, 3
 and rms delay spread $\tau_d = 2 \mu$ sec, calculate coherence time and coherence bandwidth. At a
 coded symbol rate of 19.2 kbps (IS-95) what kind of symbol distortion will be experienced?
 What type of fading will be experienced by the IS -95 channel?
 c) Consider a transmitter which radiates a sinusoidal carrier frequency of 1850 MHz. For a 3
 vehicle moving 60 mph, Compute the received carrier frequency if the mobile is moving
 directly towards the transmitting and moving away from the transmitter.
 d) Explain Okumura Model 3

6. a) Consider a GSM system with a one-way spectrum of 125 MHz and channel spacing of 200 3
 kHz. There are 3 control channels per cell and reuse factor is 7. Assuming an Omnidirectional
 antenna with 6 interferers in the first tier and a slop path loss of 40 dB/decade, calculate the
 number of calls per hour per cell site with 2% blocking during the system busy hour and an
 average call holding time is 120 seconds, The GSM uses 8 voice channels per RF channel.
 b) A cellular service provider decides to use a digital TDMA scheme which can tolerate a signal- 3
 to-interference ratio of 15 dB in the worst case. Find the optimal value of N for
 (i) omni-directional antennas, (ii) 120° sectoring, and (iii) 60° sectoring. Should sectoring be
 used? If so, which case (60° or 120°) should be used? (Assume a path loss exponent of $n = 4$
 and consider trunking efficiency.)
 c) Due to the cell splitting, the cell radius of a new cell has become $1/2$ of the old cell. Prove that 3
 the transmit power must be reduced by 12 dB in order to fill in the original coverage area
 with microcells, while maintaining the same S/I requirement.
 d) Discuss two different types of handoff algorithms. Draw the flow chart or steps involved in 3
 the handoff process.

7. a) A city has total population of 5,00,000. A network planar found the behavior of users 3
 of the city like: they generate 3 calls/hour with average holding time of 2 minutes. The
 service provider got the license of BW that can support 36 carriers of GSM.
 Determine number of sectors of 3/9 cell pattern maintaining GoS of 5%.
 b) In GSM , protection from unauthorized access is achieved through strong authentication 3
 procedures that validate the true identity of subscriber before he or she is permitted to
 receive service. Explain the procedure showing the graphical direction
 c) Explain DSDV Packet Process Algorithm 3
 d) Mention the problem of First level of interleaving. How it can be reduced using Second level 3
 of interleaving



Institute of Information Technology
Jahangirnagar University
4th Year 2nd Semester B.Sc (Hons.) Final Examination, 2020

Time: 3 Hours

IT4225: Digital Image Processing & Pattern Recognition

Full Marks: 60

Answer any **Five (05)** from the following questions. Figures at the right indicate the marks.

1. a) Show the fundamental steps of digital image processing. 3
b) How can we represent an image? How can we calculate the storage for any image? 2+2
c) Show the classifications of image. Given an image with impulse noise, Rahim applies MINMAX after MAXMIN while Karim adopts MAXMIN after MINMAX. Would they get the same results? Why or why not? 2+3
2. a) What is Gamma correction? 2
b) What is spatial resolution? How can you measure it? 3
c) For the given image $I = \begin{bmatrix} 10 & 15 \\ 20 & 25 \end{bmatrix}$ show the k-time zooming. 5
d) When the pixel replication method is applicable for zooming a digital image. 2
3. a) Briefly explain the histogram equalization technique for image enhancement. Can histogram equalization always provide a better result? State your reasons. 4
b) What is aspect ratio? For any image if aspect ratio is 6:2; pixel resolution is 480000; bits per pixel for grayscale image is 8bpp. Find the size of the image. 2+3
c) Explain dithering operation. 3
4. a) Write the differences between brightness and contrast? 3
b) Explain any grey level transform. 3
c) Explain any smoothing filter. 3
d) Explain any sharpening filter. 3
5. a) Explain how can you sharpen an image using *Laplacian* operator? 3
b) Explain about the restoration filters used when the image degradation is due to noise only. 3
c) What are the advantages of using a 'Wiener Filter' over a conventional 'Inverse Filter' for image restoration, discuss 3
d) What are high pass and low pass filters in frequency domain? How does it work? 3
6. a) Mention the characteristics used to distinguish colours. 2
b) Explain intensity slicing for colour image. 4
c) Mention the code redundancy. Explain any lossless image compression algorithm. 4
d) When we need lossy compression? 2
7. a) What is image segmentation? Explain edge detection segmentation. 6
b) Mention the phases of pattern recognition. Explain an unsupervised algorithm for pattern recognition. 6



Institute of Information Technology
Jahangirnagar University
4th Year 2nd Semester B.Sc (Hons.) Final Examination, 2020

Course Code: IT 4227

Course Title: Mobile Application Development

Full Marks: 60

Time: 3 Hours

Answer any **FIVE** questions

All parts of a particular question must be answered consecutively

- 1 (a) What are the main folders and files required to implement an application in android studio? 5
(b) How many layers are in Android Architecture? Explain the roles and features of each layers. 7
- 2 (a) Why these lines are used in Android? 5
 - i. `xmlns:android="http://schemas.android.com/apk/res/android"?`
 - ii. `<?xml version="1.0" encoding="utf-8"?>`
(b) How many callback methods are in android? Explain their behavior at different stages in Android. 5
(c) Write the meaning of `setProgress(0, 0, false)`. 2
- 3 (a) Draw and explain Activity Lifecycle of Android (use necessary code and diagram). 6
(b) What is the method to handle a menu item click events? Write the code. 3
(c) Define the terms: TextView, ListView, ScrollView 3
- 4 (a) What is Android Layout? Briefly describe different types of Layout with respective diagram. 5
(b) How to use `registerForContextMenu()` method for registering view for context menu? 5
(c) What is the method to handle a menu item click events? 2
- 5 (a) What are the commonly used `<item>` attributes in android applications for "menu"? 4
(b) List and describe the fragment callback functions throughout the fragment lifecycle. 4
(c) What is Toast and Toast method? What are its three parameters and display method? 4
- 6 (a) What is an intent object? Describe about different components than an intent object contains? 4
(b) Explain different type of intents. What is the purpose of using intent filter? Write down the syntax of an intent filter tag. 4
(c) Provide an overview of memory management in android. 4
- 7 (a) What is the difference between SQL and SQLite? 3
(b) Mention some SQLite storage classes. 3
(c) What are the several important methods that can be used in SQLite database for Android? 6

Institute of Information Technology (IIT)
Jahangirnagar University
4th Year 2nd Semester B.Sc (Hons.) Final Examination 2020
Course: IT-4259 (Computer Network Security)

Time: 3 Hours

Full Marks: 60

Answer any FIVE of the following questions.

1. a) What is network security? Briefly describe some threats to network security. [3]
b) Illustrate the CIA and DAD triads of information security. Briefly describe some attacks by which integrity of data can be threatened. [3]
c) Illustrate the general idea behind steganography. Distinguish between cryptography and steganography. [3]
d) Define the type of security attack in each of the following cases: [3]
 - i) A student breaks into a professor's office to obtain a copy of the next day's test.
 - ii) A student gives a cheque of BDT 1,000 to buy a used book. Later he finds that the cheque was cashed for BDT 10,000.
 - iii) A student sends hundreds of e-mails per day to another student using a fake return e-mail address.
2. a) Define KDC. Briefly explain the need for a key-distribution center. [3]
b) What is a session key? How a session is key established between Alice and Bob for communication? [3]
c) When the number of people using a KDC increases, the system becomes unmanageable and a bottleneck can result. How can this problem be solved? [3]
d) Define Kerberos. Outline the functions of each servers involved in Kerberos protocol. [3]
3. a) What does authentication mean? Differentiate between message and entity authentications. [3]
b) A message can be authenticated either by hash code or MAC code. Give proper illustrations for these two methods. [3]
c) Authentication by fixed password is subject to several kinds of attacks. Briefly describe some of these attacks. [3]
d) State three types of factors that are used for authentication. What do you mean by two-factor authentication? [3]
4. a) Why is division not a binary operation? Express the following set of integers in roster notation: [3]
 - (i) Set of all integers
 - (ii) Set of all positive integers
 - (iii) Set of all non-negative
 - (iv) Set of integers ranging from zero to 50
- b) What does Z_{10} and Z_{10}^* mean? Using Euler's Phi-Function, determine the number of elements in- [3]
 - i) Z_{57}^* ii) Z_{49}^* iii) Z_{37}^* iv) Z_1^*
- c) Which algorithm is used to find the multiplicative inverse of an integer in Z_n ? Assume that A and B are two integers in N modulus. Write the appropriate condition such that - [2]
 - (i) A is the multiplicative inverse of B
 - (ii) A is the additive inverse of B .
- d) When two integers X and Y are called co-prime? Using Extended Euclidean Algorithm prove that the multiplicative inverse of 10 does not exist in 26 modulus. [4]

5. a) Define P-box and S-box. Mention the necessary condition for an S-box to be invertible. [3]
- b) Show the permutation table for the following P-box. [3]

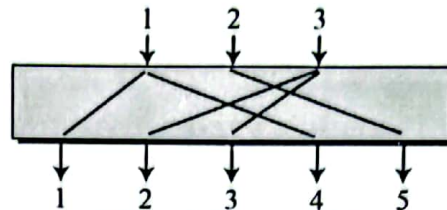


Figure 1: Question 5(b)

Show the P-box defined by the following table. How to invert this permutation table?

7	5	2	3	4	8	6	1
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- c) The input/output relationship in a 4X4 S-box is shown by the following table. Show the corresponding table for the inverse S-box. [4]

		LSBs of Input			
		00	01	10	11
MSBs of Input	00	1000	0101	1010	0000
	01	1011	0001	1100	0010
	10	0100	1111	0110	1101
	11	1100	0111	1001	0011

Figure 2: Question 5(c)

If the input to the above S-box is 1001, then what is the output?

- d) A message has 600 characters. If it is supposed to be encrypted using a block cipher of 64 bits, find the size of the padding and the number of blocks (Assume that 8-bit ASCII is used for encoding each character). [2]
6. a) Illustrate the general idea behind symmetric-key and asymmetric-key cryptography. [3]
- b) Distinguish between- [3]
- cryptology and cryptanalysis
 - symmetric-key and asymmetric-key cryptography
- c) How does asymmetric-key cryptography provide the message confidentiality and prove the authenticity of the message originator? [3]
- d) Three Pass Protocol can be used to send sensitive information across an insecure network. Give a postal analogy. [3]
7. a) What is a digital signature? Differentiate between conventional signature and digital signature. [3]
- b) Differentiate between - [3]
- Digital Signature and Cryptosystem
 - MAC Algorithm and Hash Algorithm
- c) Briefly describe three services provided by a digital signature. [3]
- d) Define hash function. Briefly describe some desirable properties of a hash function. [3]