

Midterm Examination

CSCE 4623 (Fall 2019)

October 18, 2019

Name: _____

UA ID: _____

Instructions:

1. You have 50 minutes to complete the exam. The exam is closed note and closed book. No material is allowed with you while you complete the exam.
2. There are five sections to this exam. A multiple choice section, a true false section, a fill-in-the-blank section, a short answer section, and a code review section. You should do your best to complete all sections. There is no penalty for getting a question wrong.
3. Any attempts to consult any materials, persons, or other means of obtaining information will be considered an Academic Integrity issue. You will be allowed to finish the examination, and the results will be collected and forwarded to the academic integrity board.
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"I _____ have read the academic integrity statement and I agree to abide by the policies outlined within. I understand that unwillingness to agree with the policy will result in my test being returned ungraded. I attest that I have completed this examination without any academic integrity violations, and that the work is my own."

Signature: _____

Good luck!

Multiple Choice (1 points \times 10 questions = 10 points) Answer the following questions by circling the letter which is the best possible answer of the choices:

1. Which of the following callbacks will not be run for every Android activity?
 (A) onStart()
 (B) onResume()
 (C) onRestart()
 (D) onDestroy()
2. What is the name of an intent that does not directly specify a particular class?
 (A) Implicit Intent
 (B) Explicit Intent
 (C) Pending Intent
 (D) Intent Service
3. What is the terminology used to express computation started by the system?
 (A) Passive Transaction
 (B) Active Transaction
 (C) Pending Transaction
 (D) None of these
4. In the MVP design pattern, what does the “P” stand for?
 (A) Presenter
 (B) Pending
 (C) Player
 (D) Nothing – MVP is not a design pattern
5. What mobile computing design constraint has not kept pace with the others and therefore continues to pose a significant challenge since Smartphones first arrived?
 (A) Memory
 (B) Computation Speed
 (C) Battery
 (D) Storage
6. Which of the following types of service requires a status bar icon while it is running?
 (A) Bound Service
 (B) Foreground Service
 (C) Background Service
 (D) Intent Service
7. An event message that is delivered to zero or more listening applications may be referred to in Android as a:
 (A) Content
 (B) Broadcast
 (C) Priority Interrupt
 (D) Context
8. Which of the following is not a method that is exposed by the content provider?
 (A) query
 (B) insert
 (C) delete
 (D) focus

Ignore this one

9. What fundamental Android application component may override the onBind() activity callback?
 - (A) Content Provider
 - Service
 - (C) Activity
 - (D) Broadcast Receiver
10. Which of the following is not an available Android mechanism for future computation?
 - Background Service
 - (B) Job Scheduler
 - (C) Alarm Manager and BroadcastReceiver
 - (D) None of the above

Background service can be used with other mechanism for future computation, but isn't the mechanism that allows it.

True/False (1 points × 10 questions = 10 Points) Each statement is either true or false. Fill in T/F in the provided blank space.

1. T Context defined broadcast receivers will still receive broadcasts even if the app is destroyed.
2. F Activities must use a content provider to share data for interprocess communication.
3. T Status bar notifications can have actions associated with clicking or clearing the notification
4. T A broadcast can be handled by more than one broadcast receiver
5. T* Each application is assigned a unique Linux user ID.
6. T An fragment will terminate if its host activity terminates.
7. T Background services should typically run in a separate thread
8. T Android leverages the Linux Kernel for its operating system
9. F A backstack cannot contain more than one instance of a given activity
10. T A “dwell” event in geofencing is when the user remains in a defined area for a period of time.

Fill-in-the-Blank (2 points × 10 questions = 20 points) Each question is in the form of a sentence with a blank. Fill in the blank with the word/phrase that best completes the sentence.

1. The Principle of least privilege is the concept that apps should have only the abilities that are necessary to perform their computational tasks.
2. Geocoding is the process of translating between user-friendly location names and latitude/longitude.
3. A Special activity is an activity that has no parents and is generally accessible only from clicking notifications.
4. Android apps each run in a separate virtual machine/ART to run code in isolation.
5. The Application Manifest defines the application components, permissions, and requirements.
6. MVP is the application design pattern that uses “interactors” to map events into data changes.
7. To use a content provider, the ContentResolver must be provided with a(n) URI (Ignore) that specifies the Content that will be obtained/manipulated.
8. The HAL is what provides access to lower level sensors and hardware devices.
9. A(n) Ordered broadcast may be terminated to prevent lower priority receivers from obtaining the broadcast message.
10. A notification must be part of a(n) Channel so that the user can choose how to handle like notifications.

Short Answer (4 points × 10 questions = 40 points) Provide a short (50 words or less) answer for each of the following questions:

1. Describe two of the “dimensions” of mobile computing, and comment on if the importance or relevance of each dimension is reduced over the last 12 years.

Limited Device Capabilities - Phones have less resources than traditional machines
- Less relevant cause Gordon Moore
Active Behavior - Mobile Devices should allow for system to get user attention
- Just as relevant

2. What dimension of mobile computing motivates the use of notifications? Why?

Active Behavior
User can be prompted through notifications to do computation

3. What is the principle of least privilege? Name one way that Android enforces this principle.

"You only get those things you need"
Runtime permissions/Each app in own VM/each app different linux user

4. What is a task backstack? When is it useful to create an artificial backstack?

The organization of activities that have been used in a given process organized as a stack.
When one didn't already exist (e.g. notification creating a new process)

5. Is a context-registered broadcast receiver more secure than a manifest declared broadcast receiver? Why or why not?

Yes.
Not defined in publicly accessible manifest

6. Describe two uses of the Intent object.

Start Activity
Start Service
Send Broadcast
Confuse students

7. What are some rules of thumb for timeliness? Why are these important?

0.1s - Instantaneous

1s - Users thought maintained

10s - Users attention maintained

When to prompt user in different ways

8. What is the purpose of MV* Design patterns?

Organize code into units that can work together towards a common goal. Added code portability, sustainability, readability, all the abilities really

9. Give an example of a scenario that would suggest use of a background service? Give an example of a scenario that would suggest the use of a foreground service.

Sync data to a cloud

Music service/GPS service

10. What fundamental Android component uses a publish/subscribe messaging pattern? Draw an example where they may be more than one subscriber to a message.

Broadcast receiver

Android->"Low battery" -> 5 different apps stop syncing data to cloud and hold in local cache

Open Response (20 points total) Answer the questions associated with the particular pieces of code.

Problem 1: Given the activity and broadcast receiver below, answer questions 1-3. You can assume that the IntentFilter is set up properly to receive messages on the action “com.example.midterm.ACTION1” (2 points each):

```
public class SendingActivity extends AppCompatActivity{

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.first_activity);
    }
    @Override
    protected void onResume(){
        super.onResume();
        BroadcastReceiver br = new myReceiver();
        IntentFilter filter = new IntentFilter("com.example.midterm.ACTION1");
        this.registerReceiver(br, filter);
        Intent broadcastIntent = new Intent();
        broadcastIntent.setAction("com.example.midterm.ACTION1");
        broadcastIntent.putExtra("data1",5);
        broadcastIntent.putExtra("data2","six");
        sendBroadcast(broadcastIntent);
    }
}

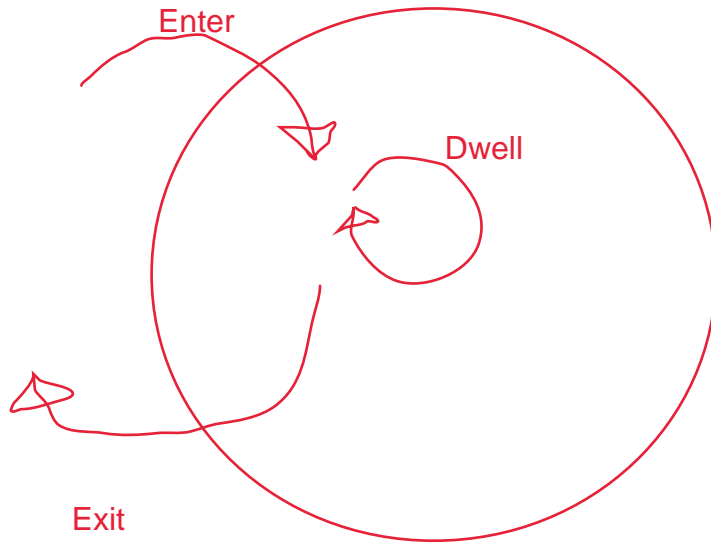
public class myReceiver extends BroadcastReceiver{
    @Override
    public void onReceive(Context context, Intent receiveIntent){
        int myInt = Intent.getIntExtra("data1",7);
        String myString = Intent.getStringExtra("data2");
        Log.d("myReceiver","A: " + String.valueOf(myInt));
        Log.d("myReceiver","B: " + myString);
    }
}
```

~~Circle yes or no for the following three questions:~~

1. What comes after “A: ” for the first logging statement? **5**
2. What comes after “B: ” for the first logging statement? **six**
3. Assume that SendingActivity is destroyed and SecondActivity from earlier sends a broadcast for action “com.example.midterm.ACTION1”. Will myReceiver execute its onReceive?

No. Context-registered broadcast receiver registered in Activity1 with Activity1 context no longer valid.

Problem 2: For Geofencing, draw a picture to describe each of the dwell, exit, and enter events (8 points):



Problem 3: Given the code below (you can assume that it builds), with two activities, answer questions 1-3 (2 points each)

```
public class FirstActivity extends AppCompatActivity{
private int firstRun = 1;
@Override
protected void onCreate(Bundle savedInstanceState) {
super.onCreate(savedInstanceState);
setContentView(R.layout.first_activity);
Log.d("FirstActivity", "A");
}
@Override
protected void onResume(){
super.onResume();
if(firstRun==1){
firstRun = 0;
Intent myIntent = new Intent(MyFirstActivity.this,SecondActivity.class);
}
startActivity(myIntent);
Log.d("FirstActivity", "B");
}
@Override
protected void onRestart(){
super.onResume();
Log.d("FirstActivity", "C");
}
@Override
protected void onPause(){
super.onPause();
Log.d("FirstActivity", "D");
}
@Override
protected void onDestroy(){
super.onDestroy();
Log.d("FirstActivity", "E");
}
}

public class SecondActivity extends AppCompatActivity{
@Override
protected void onCreate(Bundle savedInstanceState) {
super.onCreate(savedInstanceState);
setContentView(R.layout.second_activity);
Log.d("SecondActivity", "F");
}
@Override
protected void onStart(){
super.onStart();
Log.d("SecondActivity", "G");
finish();
}
}
```

1. What is the order of logging statements that occurs on starting the application, assuming FirstActivity is the main activity? ABDFGCB
2. What is the order of logging statements if the user leaves the app without destroying, and then returns to the application? DCB
3. What is the order of logging statements if after returning to the application, the user presses the back button until the app is killed? DE