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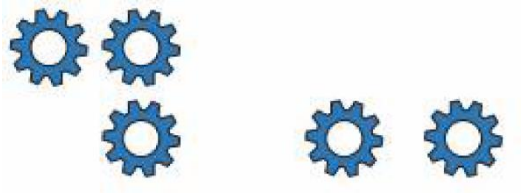
Internal Assessment Test 1 Answer Key– Feb. 2022									
Sub:	Mobile Applications					Sub Code:	18MCA52	Branch:	MCA
Date:	1/2/2022	Duration:	90 min's	Max Marks:	50	Sem	V		

Q1) Briefly discuss the Gestalt's principles (10 marks)

The *Gestalt principles* have had a considerable influence on design, describing how the human mind perceives and organizes visual data. The Gestalt principles refer to theories of visual perception developed by German psychologists in the 1920s. According to these principles, every cognitive stimulus is perceived by users in its simplest form. Key principles include *proximity, closure, continuity, figure and ground,* and *similarity.*

Proximity:

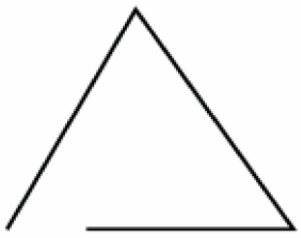
- Users tend to group objects together.
- Elements placed near each other are perceived in groups as shown in Figure



- Many smaller parts can form a unified whole.
- Icons that accomplish similar tasks may be categorically organized with proximity.
- Place descriptive text next to graphics so that the user can understand the relationship between these graphical and textual objects.

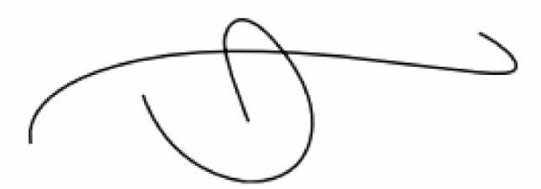
Closure:

- If enough of a shape is available, the missing pieces are completed by the human mind.
- In perceiving the unenclosed spaces, users complete a pattern by filling in missing information. For example, people recognize it as a triangle even though the below Figure is not complete.
- In grid patterns with horizontal and vertical visual lines, use closure to precisely show the inside and outside of list items.



Continuity:

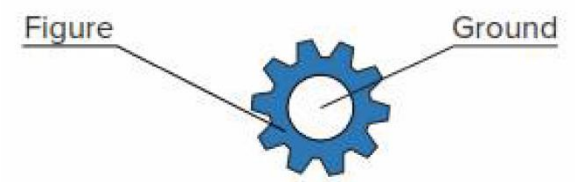
- The user's eye will follow a continuously-perceived object. When continuity occurs, users are compelled to follow one object to another because their focus will travel in the direction they are already looking.
- They perceive the horizontal stroke as distinct from the curled stroke in the below Figure, even though these separate elements overlap.



- Smooth visual transitions can lead users through a mobile application, such as a link with an indicator pointing toward the next object and task.

Figure and Ground:

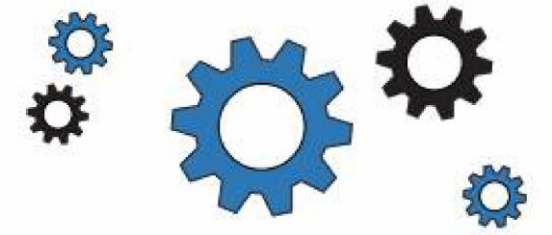
- A figure, such as a letter on a page, is surrounded by white space, or the ground.
- For example, in below Figure, the figure is the gear icon, and the ground is the surrounding space.



- Primary controls and main application content should maintain a distinct separation between figure and ground.

Similarity:

- Similar elements are grouped in a semi-automated manner, according to the strong visual perception of colour, form, size, and other attributes. Figure 1.5 illustrates it.
- In perceiving similarity, dissimilar objects become emphasized.
- Strict visual grids confuse users by linking unrelated items within the viewport.
- The layout should encourage the proper grouping of objects and ideas.



Q2) What are the preliminary cost involved in mobile application development?

There are many costs associated with mobile application development.

- Each developer will need hardware and software to develop the applications on.
- The team will need devices to test the software on.
- And if you want to deploy your application to any public market, then your company will need accounts on the various markets (these often renew annually).

Hardware

- To develop good mobile apps, you'll need an Intel-based Mac. Intel versions of Mac because you can run Windows on them either virtually (using something like Parallels, or VMWare Fusion) or on the bare metal (using Apple's BootCamp).
- You'll also need multiple monitors. The emulator/simulator running in one monitor, Dev Tool (IDE) running on another, and a web browser on another with the documentation for the platform for which you are developing. Having access to all of this information at once prevents context switching for a developer, and helps maintain focus.
- The emulator and simulators are great, but not perfect, so you'll need one of each of the types of devices you want to develop for.

Software

Following sections present an outline for what you will need for all of the platforms.

TABLE 1-1: Software Needed for Development

TARGETED FRAMEWORK	SOFTWARE REQUIRED
Window Phone 7	Windows Phone SDK Visual Studio Express Expression Blend for Windows Phone (Windows only)
iOS	xCode 4, iOS SDK xCode 4.1, iOS SDK (on Mac OS X 107) (Mac Only)
Android	Eclipse, Android SDK
BlackBerry	Eclipse, BlackBerry Plugin, BlackBerry Simulator (only works on Windows)
Titanium	Titanium Studio, Titanium Mobile SDK + Android software + iOS software
PhoneGap	PhoneGap Plugin + iOS software (Mac only) + Android software + Windows Phone 7 software (Windows only)
Any Framework Text Editors	TextMate (Mac) Notepad++ (Windows)

Licenses and Developer Accounts

The following table contains information regarding all of the various accounts necessary to develop for each platform and costs associated with such.

PLATFORM	URL	CAVEATS
BlackBerry	`http://us.blackberry.com/developers/appworld/distribution.jsp`	
Titanium	`https://my.appcelerator.com/auth/signup/offer/community`	
Windows Dev Marketplace	`http://create.msdn.com/en-US/home/membership`	Can submit unlimited paid apps, can submit only 100 free apps. Cut of Market Price to Store: 30%
Apple iOS Developer	`http://developer.apple.com/programs/start/standard/create.php`	Can only develop ad-hoc applications on up to 100 devices. Developers who publish their applications on the App Store will receive 70% of sales revenue, and will not have to pay any distribution costs for the application.
Android Developer	`https://market.android.com/publish/signup`	Application developers receive 70% of the application price, with the remaining 30% distributed among carriers and payment processors.

Documentation and APIs

Following are links to the respective technologies' online documentation and APIs. This will be the location for the latest information in the respective technology.

- MSDN Library: http://msdn.microsoft.com/en-us/library/ff402535(v=vs.92).aspx
- iOS Documentation: http://developer.apple.com/devcenter/ios/index.action
- BlackBerry Documentation: http://docs.blackberry.com/en/developers/?userType=21
- Android SDK Documentation: http://developer.android.com/reference/packages .html and http://developer.android.com/guide/index.html
- PhoneGap Documentation: http://docs.phonegap.com/
- Titanium API Documentation: http://developer.appcelerator.com/apidoc/mobile/latest

The Bottom Line

- Total cost per developer to create, maintain, and distribute mobile applications for all the platforms you can expect to pay a few thousand dollars just for the minimum infrastructure. And this is really the bare minimum for development.
- Given the opportunity to expand this more I would upgrade the laptop to a MacBook Pro, with plenty of RAM, and upgrade the hard disk drive (HDD) to a solid-state drive (SSD). By making these upgrades you will incur a higher initial cost, but the speed increase compared to the bare bones will recoup that cost, if only in peace of mind.
- It is difficult to quantify the savings from these upgrades, but developers without them are at a distinct disadvantage.

Q3) Describe the effective use of screen real estate

- The first step to use the smaller interfaces of mobile devices effectively is to know the context of use. Who are the users, what do they need and why, and how, when, and where will they access and use information?
- Mobile design is difficult, as developers try to elegantly display a telescoped view of almost limitless information. But user experience issues are amplified on mobile interfaces.
- Cognitive load increases while attention is diverted by the needs to navigate, remember what was seen, and re-find original context.
- Cognitive load is the mental effort to comprehend and use an application, whatever the inherent task complexity or information structure may be.
- Effectively use screen real estate by embracing minimalism, maintaining a clear visual hierarchy, and staying focused.

Embrace Minimalism

- Limit the features available on each screen, and use small, targeted design features.
- Content on the screen can have a secondary use within an application, but the application designer should be able to explain why that feature is taking up screen space.
- Banners, graphics, and bars should all have a purpose.

Use a Visual Hierarchy

- Help users fight cognitive distractions with a clear information hierarchy.
- Draw attention to the most important content with visual emphasis.
- Users will be drawn to larger items, more intense colors, or elements that are called out with bullets or arrows; people tend to scan more quickly through lighter color contrast, less intense shades, smaller items, and text-heavy paragraphs.

- A consistent hierarchy means consistent usability; mobile application creators can create a hierarchy with position, form, size, shape, color, and contrast.

Stay Focused

- Start with a focused strategy, and keep making decisions to stay focused throughout development.
- A smaller file size is a good indicator of how fast an application will load, so the benefits of fighting feature creep extend beyond in-application user experience.
- Focused content means users won't leave because it takes too long for the overwhelming amount of images per screen to load.
- And users won't be frustrated with the number of links that must be cycled through to complete a task. Text-heavy pages reduce engagement as eyes glaze over and users switch to another application.
- If people have taken the time to install and open an application, there is a need these users hope to meet.
- Be methodical about cutting back to user necessities. Build just enough for what users need, and knowing what users need comes from understanding users

Q4) Explain the various information design tools of mobile interface design

Sketching and Wireframes

- Sometimes we need to shape ideas on paper before focusing on the pixels.
- Storyboard application screens to outline features and flow, focusing on the big picture.
- Save wasted time developing the wrong thing the right way by involving all key stakeholders in the sketching and wire framing process.
- Mobile stencils are even on the market to help non doodlers pencil in ideas before turning to computer screens**.**
- A wireframe is a rough outline of each application's framework.
- Stay focused on functionality during wire framing; these easy-to-share, easy-to-edit files are just a skeleton of the design.
- A simple image will do, but tools such as Balsamiq Mock-ups let designers drop boilerplate into a wireframe editor

Mock-up Designs

- When you are ready to consider colors and fonts, you can build the mock-up design concept in Adobe Creative Suite.
- The final images of buttons and icons will be pulled from the final mock-up design, but details will solidify only after some experimentation.
- Look to existing stencils for a streamlined process that does not re-create the wheel.

Prototype:

- "Perfection is the enemy of good," and designs that start as ugly prototypes quickly progress to elegant, usable applications.
- The most primitive start is a most important iteration.
- Platform-specific tools are available, such as the Interface Builder or Xcode for iOS, but HTML and CSS are a standard and simple way to quickly build prototypical interactions

On-device Testing:

- One of the most important tools during design will be the physical device.
- Buy, or Borrow, the devices and application will run on.

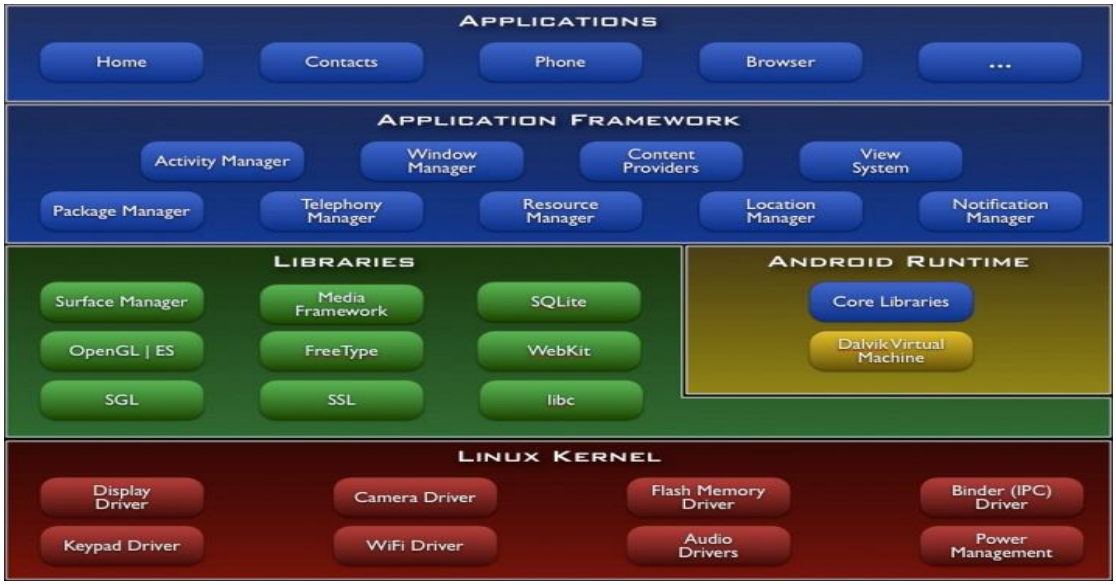
Simulators and Emulators:

- Simulators and emulators are important when the hardware is unavailable and the service contracts for devices are prohibitively expensive.
- A simulator uses a different codebase to act like the intended hardware environment.
- An emulator uses a virtual machine to simulate the environment using the same codebase as the mobile application.
- It can be cost prohibitive to test on many devices, making emulators incredibly useful.
- Emulators can be run in collaboration with eye-tracking software already available in most testing labs, but an emulator lacks the touch experience of a mobile application.
- At an absolute minimum, use one of the target devices for user testing at this level.
- During design, development, testing, and demonstration, these tools are incredibly valuable.

Q5)What is android? Explain the android architecture with its features and diagram.

- Android is a mobile operating system that is based on a modified version of Linux.
- It was originally developed by a start-up of the same name, Android, Inc.
- Android is open and free; most of the Android code was released under the open-source Apache License, which means that anyone who wants to use Android can do so by downloading the full Android source code.
- The main advantage of adopting Android is that it offers a unified approach to application development.
- Android OS is a Linux-based open source platform for mobile, cellular handsets developed by Google and the Open Handset Alliance

The Android OS is roughly divided into five sections in four main layers as shown in Figure



Linux kernel: This is the kernel on which Android is based. This layer contains all the low level device drivers for the various hardware components of an Android device.

Libraries:

- These contain all the code that provides the main features of an Android OS. For example, the SQLite library provides database support so that an application can use it for data storage.
- The WebKit library provides functionalities for web browsing.

Android runtime :

- At the same layer as the libraries, the Android runtime provides a set of core libraries that enable developers to write Android apps using the Java programming language.
- The Android runtime also includes the Dalvik virtual machine, which enables every Android application to run in its own process, with its own instance of the Dalvik virtual machine (Android applications are compiled into the Dalvik executables).
- Dalvik is a specialized virtual machine designed specifically for Android and optimized for battery-powered mobile devices with limited memory and CPU.

Application Framework: Exposes the various capabilities of the Android OS to application developers so that they can make use of them in their applications.

Applications:

- At this top layer, you will find applications that ship with the Android device (such as Phone, Contacts, Browser, etc.), as well as applications that you download and install from the Android Market.
- Any applications that you write are located at this layer.

Features of Android

As Android is open source and freely available to manufacturers for customization, there are no fixed hardware and software configurations. However, Android itself supports the following features:

- Storage : Uses SQLite, a lightweight relational database, for data storage.
- Connectivity : Supports GSM/EDGE, IDEN, CDMA, EV-DO, UMTS, Bluetooth (includes A2DP and AVRCP), WiFi, LTE, and WiMAX.
- Messaging: Supports both SMS and MMS.
- Web browser: Based on the open-source WebKit, together with Chrome's V8 JavaScript engine
- **Media support:** Includes support for the following media: H.263, H.264 (in 3GP or MP4 container), MPEG-4 SP, AMR, AMR-WB (in 3GP container), AAC, HE-AAC (in MP4 or 3GP container), MP3, MIDI, Ogg Vorbis, WAV, JPEG, PNG, GIF, and BMP
- **Hardware support:** Accelerometer Sensor, Camera, Digital Compass, Proximity Sensor, and GPS
- **Multi-touch:** Supports multi-touch screens
- **Multi-tasking:** Supports multi-tasking applications
- **Flash support:** Android 2.3 supports Flash 10.1.
- **Tethering:** Supports sharing of Internet connections as a wired/wireless hotspot

Q6)Describe the anatomy of the android application

The various folders and their files are as follows:

- **src** — Contains the file, ***MainActivity.java***. It is the source file for your activity. You will write the code for your application in this file.
- **Android 4.4.2** — This item contains one file, ***android.jar***, which contains all the class libraries needed for an Android application.
- **gen** — Contains the ***R.java*** file, a compiler-generated file that references all the resources found in your project. ***You should not modify this file.***
- **assets** — This folder contains all the assets used by your application, such as HTML, text files, databases, etc.
- **res** — This folder contains all the resources used in your application. It also contains a few other subfolders:
  - **drawable** - **<resolution>**: All the image files to be used by the Android application must be stored here.

- **layout -** contains **activity_main.xml** file, which the is GUI of the application.
- **values -** contains files like **strings.xml, styles.xml** that are need for storing the string variables used in the applications, creating style-sheets etc.

- **AndroidManifest.xml** — This is the manifest file for your Android application. Here you specify the permissions needed by your application, as well as other features (such as intent-filters, receivers, etc.).

Details of some of the important files are given hereunder:

- **strings.xml File:** The activity_main.xml file defines the user interface for your activity. Observe the following in bold:

```
<TextView android:layout_width=”fill_parent”
android:layout_height=”wrap_content”
android:text=”@string/hello” />
```

The ***@string*** in this case refers to the strings.xml file located in the res/values folder. Hence, ***@string/hello*** refers to the hello string defined in the ***strings.xml*** file, which is “Hello World!”:

```
<?xml version=”1.0” encoding=”utf-8”?>
<resources>
<string name=”hello”>Hello World!</string>
<string name=”app_name”>HelloWorld</string>
</resources>
```

It is recommended that you store all the string constants in your application in this ***strings.xml*** file and reference these strings using the ***@string*** identifier. That way, if you ever need to localize your application to another language, all you need to do is replace the strings stored in the ***strings.xml*** file with the targeted language and recompile your application.

- **AndroidManifest.xml File:** This file contains detailed information about the application. Observe the code in this file:

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.HelloWorld"
    android:versionCode="1"
    android:versionName="1.0" >

    <uses-sdk
        android:minSdkVersion="19"
        android:targetSdkVersion="19" />

    <application
        android:allowBackup="true"
        android:icon="@drawable/ic_launcher" android:label="@string/app_name"
        android:theme="@style/AppTheme" >

        <activity
            android:name=".MainActivity"
            android:label="@string/app_name" >
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category android:name="android.intent.category.LAUNCHER"/>
```

```
            </intent-filter>
        </activity>
    </application>
</manifest>
```

Key points about this file are as below :

- It defines the package name of the application as ***net.learn2develop.HelloWorld***.
- The version code of the application is 1. This value is used to identify the version number of your application. It can be used to programmatically determine whether an application needs to be upgraded.
- The version name of the application is 1.0. This string value is mainly used for display to the user.
- The application uses the image named ***ic_launcher.png*** located in the ***drawable*** folder.
- The name of this application is the string named **app_name** defined in the ***strings.xml*** file.
- There is one activity in the application represented by the ***MainActivity.java*** file. The label displayed for this activity is the same as the application name.
- Within the definition for this activity, there is an element named <intent-filter>:
  - The action for the intent filter is named ***android.intent.action.MAIN*** to indicate that this activity serves as the entry point for the application.
  - The category for the intent-filter is named ***android.intent.category.LAUNCHER*** to indicate that the application can be launched from the device's Launcher icon.
- Finally, the ***android:minSdkVersion*** attribute of the <uses-sdk> element specifies the minimum version of the OS on which the application will run.

- **R.java File:** As you add more files and folders to your project, Eclipse will automatically generate the content of **R.java**, which at the moment contains the following:

```
package net.learn2develop.HelloWorld;

public final class R {
public static final class attr {
}
        public static final class drawable {
                public static final int icon=0x7f020000;
}
public static final class layout {
        public static final int main=0x7f030000;
}
public static final class string {
        public static final int app_name=0x7f040001; public static final int
        hello=0x7f040000;
}
}
```

You are not supposed to modify the content of the R.java file; Eclipse automatically generates the content for you when you modify your project.

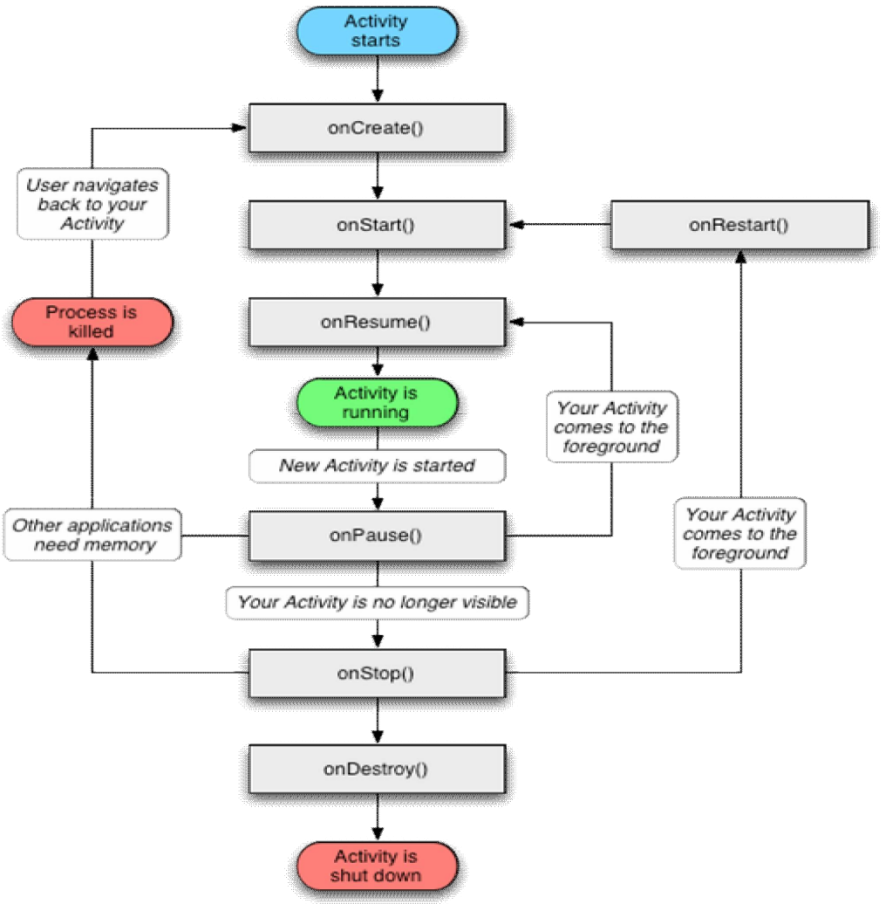
- **MainActivity.java File:** The code that connects the activity to the UI (activity_main.xml) is the setContentView() method, which is in the MainActivity.java file:

```
package net.learn2develop.HelloWorld; import
android.app.Activity;
import android.os.Bundle;

public class MainActivity extends Activity
{
        /** Called when the activity is first created. */ @Override
        public void onCreate(Bundle savedInstanceState)
        {
                super.onCreate(savedInstanceState);
                setContentView(R.layout.main);
        }
}
```

Here, **R.layout.main** refers to the **activity_main.xml** file located in the **res/layout** folder. As you add additional XML files to the **res/layout** folder, the filenames will automatically be generated in the **R.java** file. The **onCreate()** method is one of many methods that are fired when an activity is loaded.

Q7)Explain briefly life cycle of an activity with diagram and code snippets

The Activity base class defines a series of events that governs the life cycle of an activity. Figure 2.2 shows the life cycle of an activity and the various stages it goes through — from when the activity is started until it ends.



The Activity class defines the following events:

- onCreate() — Called when the activity is first created
- onStart() — Called when the activity becomes visible to the user
- onResume() — Called when the activity starts interacting with the user
- onPause() — Called when the current activity is being paused and the previous activity is being resumed
- onStop() — Called when the activity is no longer visible to the user
- onDestroy() — Called before the activity is destroyed by the system (either manually or by the system to conserve memory)
- onRestart() — Called when the activity has been stopped and is restarting again

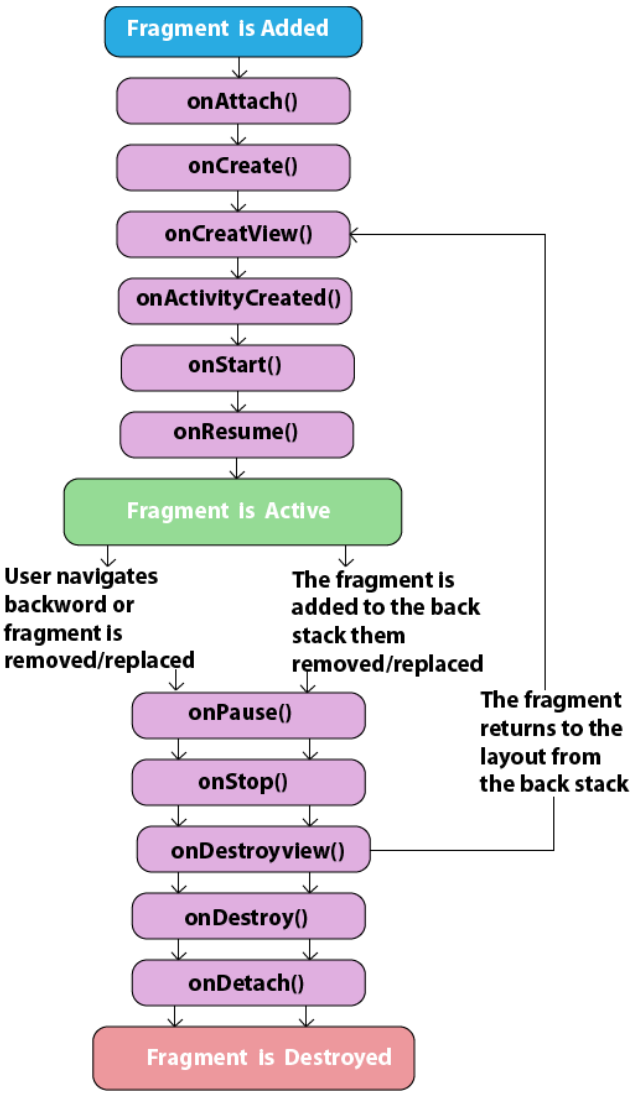
By default, the activity created for you contains the onCreate() event. This event handler contains the code that helps to display the UI elements of your screen.

```
import android.app.Activity; import
android.os.Bundle; import
android.util.Log;

public class MainActivity extends Activity
{
        String tag = "Events";
        /** Called when the activity is first created. */ @Override
        public void onCreate(Bundle savedInstanceState)
        {
                super.onCreate(savedInstanceState);
                setContentView(R.layout.main); Log.d(tag, "In the
                onCreate() event");
        }

        public void onStart()
      {
              super.onStart();
              Log.d(tag, "In the onStart() event");
      }
      public void onRestart()
      {
                super.onRestart();
              Log.d(tag, "In the onRestart() event");
      }

      public void onResume()
      {
                super.onResume();
                Log.d(tag, "In the onResume() event");
      }
      public void onPause()
      {
              super.onPause();
              Log.d(tag, "In the onPause() event");
      }
      public void onStop()
      {
              super.onStop();
```

```
        Log.d(tag, "In the onStop() event");
    }
    public void onDestroy()
    {
        super.onDestroy();
        Log.d(tag, "In the onDestroy() event");
    }

}
```

Q8)Explain briefly life cycle of an Fragment with diagram and code snippets

The lifecycle events of a Fragment reflect those of its parent Activity. But, when the container Activity is in its active and resumed state by adding or removing a fragment, it will affect the lifecycle independently. Figure shows various events in lifecycle of fragments.




```
import android.app.Activity;
```

```
import android.os.Bundle;
import android.app.Fragment;
import android.view.View;
import android.view.ViewGroup;
import android.view.LayoutInflater;
 import android.util.Log;

public class MainActivity extends Fragment
{
        @Override
        public void onCreateView(LayoutInflater inflater, ViewGroup container, Bundle
        saved InstanceState)
        {
                Log.d("Fragment 1", "on CreateView");
                Return
                inflater.inflate(R.layout.fragment1,container,false);
        }

        @Override
        public void onAttach(Activity activity)
        {
                super.onAttach(activity);
                Log.d("Fragment 1", "onAttach");
        }


        public void onCreate (Bundle savedInstanceState)
        {
                super.onCreate(savedInstanceState);
                Log.d("Fragment 1", "onCreate");

        }
        public void onActivityCreated (Bundle savedInstanceState)
        {
                super.onActivityCreated(savedInstanceState);
                Log.d("Fragment 1", "onActivityCreated");

        }


        public void onStart()
      {
                super.onStart();
                Log.d("Fragment 1",  "In the onStart");
      }
      public void onResume()
      {
                super.onResume();
                Log.d("Fragment 1", "In the onResume ");
      }
      public void onPause()
      {
```

```
            super.onPause();
            Log.d("Fragment 1", "In the onPause ");
        }
        public void onStop()
        {
            super.onStop();
            Log.d("Fragment 1", "In the onStop);
        }
        public void onDestroyView()
        {
            super.onDestroyView();
            Log.d("Fragment 1", "In the onDestroyView ");
        }
        public void onDestroy()
        {
            super.onDestroy();
            Log.d("Fragment 1", "In the onDestroy ");
        }
        public void onDetach()
        {
            super.onDetach();
            Log.d("Fragment 1", "In the onDetach ");
        }


}
```

Like activities, fragments in android also have their own life cycle. As you have seen, when a fragment is being created, it goes through the following states:
onAttach()
onCreate()
onCreateView()
onActivityCreated()

When the fragment becomes visible, it goes through these states:
onStart()
onResume()

when the fragment goes into the background mode, it goes through these states:
onPause()
onStop()

when the fragment is destroyed (when the activity is currently hosted in is destroyed), it goes through the following states:
onPause()
onStrop()
onDestroyView()
onDestroy()
onDetach()

Like activities, you can restore an instance of fragment using a Bundle object, in the following states:
onCreate()
onCreateView()
onActivityCreated()

Most of the states experienced by a fragment are similar to those of activities. However, a few new states are specific to

fragment
onAttached() – Called when fragment has been associated with the activity
onCreateView() – Called to create the view for the fragment
onActivityCreated()-Called when activit's onCreate() method has been returned.
onDestroyView() – Called when the fragment's view is being removed
onDetach() – Called when the fragment is detached from the activity

Q9) Develop a mobile application to list the tourist places of Karnataka using List View.

Activity_mail.xml

```
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context="com.example.lab5.MainActivity" >

    <TextView
        android:id="@+id/textView1"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_alignParentTop="true"
        android:layout_centerHorizontal="true"
        android:layout_marginTop="20dp"
        android:text="Karnataka Tourist Places" />

    <ListView
        android:id="@+id/listView1"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_below="@+id/textView1"
        android:layout_centerHorizontal="true"
        android:layout_marginTop="14dp" >
    </ListView>

</RelativeLayout>
```

MainActivity.java

```
package com.example.lab5;


import android.app.Activity;
import android.os.Bundle;
import android.widget.ArrayAdapter;
import android.widget.ListView;


public class MainActivity extends Activity {

      String[] places = {
                  "Coorg",
                  "Hampi",
                  "Gokarna",
                  "Bandipur National Park",
                  "Jog Falls",
                  "Nandi Hills",
                  "Dharmashala",
                  "Mysore",
                  "Chikmagalur",
                  "Bengaluru",
```

```
                    "Badami",
                    "Nagarhole National Park"
                    };

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        ArrayAdapter adapter= (new ArrayAdapter<String>(this,
                    android.R.layout.simple_list_item_1, places));
       ListView listview=(ListView) findViewById(R.id.listView1);
       listview.setAdapter(adapter);
    }



}
```

Q10) Devise an application that draws basic graphical primitives (rectangle, circle) on the screen.

Code for Activity_main.xml:

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent">

    <ImageView
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:id="@+id/imageView" />
</RelativeLayout>
```

Code for MainActivity.java:

```
package com.example.ashwini.program4;

import android.app.Activity;
import android.graphics.Bitmap;
import android.graphics.Canvas;
import android.graphics.Color;
import android.graphics.Paint;
import android.graphics.drawable.BitmapDrawable;
import android.os.Bundle;
import android.widget.ImageView;

public class MainActivity extends Activity
{
    @Override
    public void onCreate(Bundle savedInstanceState)
    {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        //Creating a Bitmap
        Bitmap bg = Bitmap.createBitmap(720, 1280, Bitmap.Config.ARGB_8888);

        //Setting the Bitmap as background for the ImageView
        ImageView i = (ImageView) findViewById(R.id.imageView);
        i.setBackgroundDrawable(new BitmapDrawable(bg));
```

```
        //Creating the Canvas Object
        Canvas canvas = new Canvas(bg);

        //Creating the Paint Object and set its color & TextSize
        Paint paint = new Paint();
        paint.setColor(Color.BLUE);
        paint.setTextSize(50);

        //To draw a Rectangle
        canvas.drawText("Rectangle", 420, 150, paint);
        canvas.drawRect(400, 200, 650, 700, paint);

        //To draw a Circle
        canvas.drawText("Circle", 120, 150, paint);
        canvas.drawCircle(200, 350, 150, paint);

    }
}
```