Mobile Computing Final 9906

1. Please classify the following standards into evolutions of wireless networks with the ascending order of four covered area (Personal area networks (PAN), Low-tier wireless systems, Wireless local area networks (WLAN), and Public wide-area (high-tier) wireless networks): IEEE 802.11, GSM, Bluetooth, GPRS, PHS, WCDMA. (6%)

2. What are network technology advances of the 3G wireless system over 2G? (9%)

3. Draw a figure to show 3GPP R5 data network architecture. List important components in the architecture? (18%)

4. (a) List three components of the Global Satellite Positioning System (GPS). (6%) (b) Which two important features does it have? (4%) (c) What purpose of the GPS data protocol is? (3%) (d) Write down the name of the GPS data protocol used in your programming project. (2%) (15% total)

5. (a) With which three precise coordinate items do digital (Vector) maps use to represent the map locations? (6%) (b) What procedures are used for map digitization with five steps? (10%) (c) With which three primitives to associate each features in the digital map? (6%) (22% total)

6. (a) What is the geographic information system (GIS)? (3%) (b) What is the Route Guidance process? (3%) (c) Which two tasks are consisted in the Route Guidance process? (6%) (12% total)

7. Which three methods can enhance the accuracy of GPS Positioning against GPS Errors and Biases? How they work? (name: 2%, functions: 4%, 18% total)

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1. Please classify the following standards into evolutions of wireless networks with the ascending order of covered area: IEEE 802.11, GSM, Bluetooth, GPRS, PHS, WCDMA. (6%)

Ans :

- Personal area networks (PAN): Bluetooth (1%)
- Low-tier wireless systems: PHS (1%)
- Wireless local area networks (WLAN): IEEE 802.11 (1%)
- Public wide-area (high-tier) wireless networks: GSM, GPRS, 3G (WCDMA) (3%)

2. What are network technology advances of the 3G wireless system over 2G? (9%)

Ans:

- 3G over 2G: (3% each，任選三答案)
  - significantly increase radio system capabilities and per-user data rates,
  - support IP-based voice, data and multimedia services,
  - enhance quality-of-service support,
  - improve interoperability

3. Draw a figure to show 3GPP R5 data network architecture. List important components in the architecture? (18%)

Ans: Chap2, pp.5

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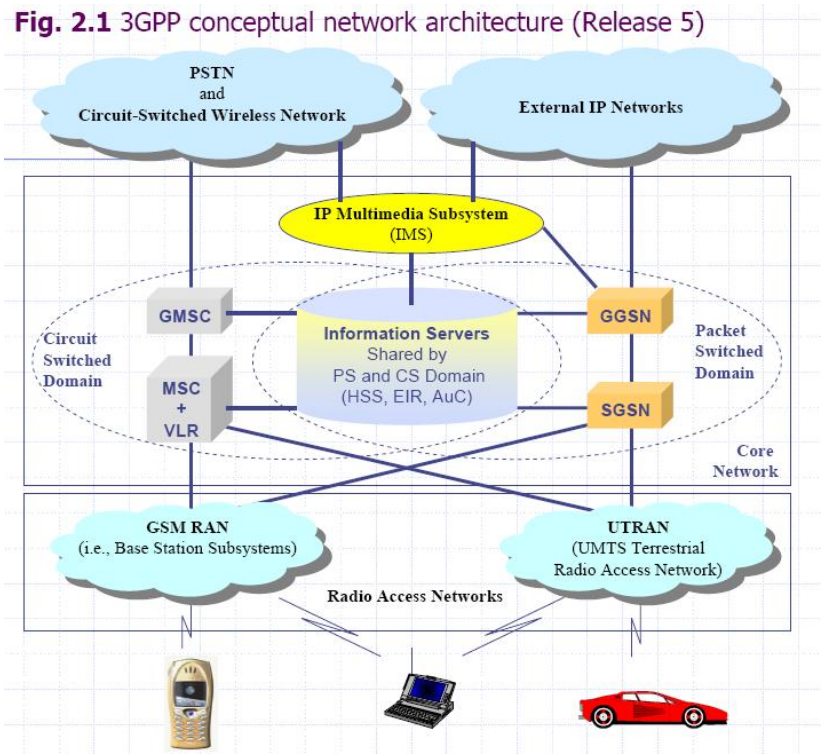

(圖中必須包含以下 components)

- Radio access networks: (RAN) (2%)
  - GSM/EDGE RAN (GERAN) (2%)
  - UMTS terrestrial RAN (UTRAN) (2%)
- Core networks (CN) (2%)
  - Circuit-switched (CS) domain (1%)
    ⇨ GMSC, MSC+VLR (2%)
  - Packet-switched (PS) domain (1%)
    ⇨ GGSN, SGSN (2%)
  - IP multimedia subsystem (IMS) (2%)
  - Information servers (2%)

4. (a) List three components of the Global Satellite Positioning System (GPS). (6%) (b) Which two important features does it have? (4%) (c) What purpose of the GPS data protocol is? (3%) (d) Write down the name of the GPS data protocol used in your programming project. (2%)

Ans:

(a) GPS Satellite broadcast its own-specific signal for each satellite (6%)

- GPS receiver **passively** receives these signal from the sky
- GPS ground stations control and adjust the satellite orbits

(b) GPS is **autonomous** positioning system (以下任選二) (4%)

- It uses **one-way** communication
- They also do the information synchronization among these satellite

(c) To combine data from different GPS receiver manufactured by different GPS manufacturers (3%)

(d) NMEA 0183 (2%)

5. (a) With which three precise coordinate items do digital (Vector) maps use to represent the map locations? (6%) (b) What procedures are used for map digitization with five steps? (10%) (c) With which three primitives to associate each features in the digital map? (6%)

Ans:

(a) Digital (Vector) Maps have precise coordinate system to represent the map locations (6%)

- Longitude
- Latitude
- Altitude

(b) Unit03.ppt pp.13 (10%)

- Prepare the raster file of geographical map or aerial/satellite photographic
- Survey the significant cartographic information
- A Set of Points containing the information about latitude and longitude
- Draw the lines/segments/shapes according to the surveyed points
- Adjust the locations of those components based on the map matching
- Store these components in a digital form

(c) Three primitives (6%)

- Points
- Lines
- Areas

8. (a) What is the geographic information system (GIS)? (3%) (b) What is the Route Guidance process? (3%) (c) Which two tasks are consisted in the Route Guidance process? (6%) (12% total)

Ans:

(a) A **geographic information system (GIS)** is a system for capturing, storing, analyzing and managing data and associated attributes 或 GIS is a computer system which is capable of integrating, storing, editing, analyzing, sharing, and displaying geographically-referenced information (3%)

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(b) Route Guidance is the process to guide the driver along the route along the route (3%)

(c) Route Guidance consists of two tasks (6%)

- A maneuver generation task
- A route-following task

9. Which three methods can enhance the accuracy of GPS Positioning against GPS Errors and Biases? How they work? (name: 2%, functions: 4%)

Ans:

1. DGPS – Differential GPS

- It uses a network of fixed ground based reference stations to broadcast the difference information (2%)
  - Between the positions indicated by the satellite systems and the known fixed positions (or between the measured satellite pseudoranges and actual (internally computed) pseudoranges)
- Receiver stations may correct their pseudoranges by the same amount (2%)

2. WAAS – Wide Area Augmentation System

- It is achieved via a network of ground stations which measure the GPS signal and route the measurements to two master stations (2%)
- They generate and send the correction messages to geostationary satellites which broadcast the correction messages back to Earth (2%)
- WAAS-enabled GPS receivers will apply the corrections to their computed GPS position (1%)

3. AGPS – Assisted-GPS

- Mobile telephones with embedded GPS engines, 利用 base station 的信號，配合傳統 GPS 衛星信號，讓定位的速度更快。(3%)