**MIDTERM Test 2**

**Regulation and Policy in the Telecommunications Industry (TM 612)**

**Test Code-120MIN-LEC-04-06-S2022**

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**INSTRUCTIONS (Read Carefully!):**

You will be given 120 minutes to complete the test.

1. The test is made up of three sections, A, B, and C.

**Section A** consists of 12 multiple-choice questions. You will be graded for 10 correct answers. Each correct answer carries 4 points. (Max Score 40)

**Section B** comprises of 4 questions that require short answers. You will be graded for 3 correct answers. Each correct answer carries 8 points. (Max Score 24)

**Section C** consists of 4 Problems/Descriptive Questions. You will be graded for 3 correct answers. Each correct answer carries 12 points. (Max Score 36).

**(TOTAL SCORE= 100 Points)**

SECTION A

**Quiz-1**: **Pick the most accurate statement.**

**The Communications Acts are United States federal laws. The goal of these acts is to promote access to the market and encourage competition. What was the leading flaw of the Radio Act of 1910 that gave birth to the the Act 1912?**

1. Ships carrying over 60 passengers had to carry a radio equipment
2. Trans-Atlantic radio technology developed by Marconi created a patentability issue
3. The Act did not address the radio signal interference related issues
4. The Act did not charge FCC to implement the Act

**Quiz-2: Pick the most accurate statement. There were two acts created in 1934 (a) the Securities Exchange Act of 1934 and (b) the Communication Act of 1934. The communication Act of 1934 does not:**

1. Provide for the regulation of interstate and foreign communications
2. Require for the safety of consumers, e.g., by limiting the transmit radio power and in general protection of the environment
3. Combine regulations of telephone, telegraph, and radio communications
4. None of the above statements is correct

**Quiz-3**. **Pick the most accurate statement. The Radio Act of 1912, formally known as "An Act to Regulate Radio Communication" (37 Stat. 302), is a United States federal law that was replaced by the Radio Act of 1927. The Act of 1927:**

* 1. Authorized FRC to investigate the Sinking of the Titanic in 1912
  2. Created a mandate for the Ship’s Crew to stay alert and avoid fatigue
  3. Established a new federal agency known as FRC (Federal Radio Commission)
  4. Authorized the Broadcasters to either change the radio frequencies or raise operating transmit power in case of severe interference

**Quiz-4. Pick the most accurate statement. Though governments establish communications acts and regulations to improve overall performance, sometimes the regulations can be subject to considerable debate. In your judgment which regulation(s) is/are not subject to debate:**

1. Laws and rules are sometimes passed based on political interest rather than consumer interest
2. Laws of the decades-old acts are still applicable to modern ISPs and TSPs
3. There are too many laws and rules
4. None of the statements is correct

**Quiz-5. The FCC’s focus is on Open RAN for future mobile communication systems. What are some of the Multiple Radio Access Technologies for the existing RANs?**

1. TRATs (Terrestrial Radio Access Technologies) and OCATs (Open Code Access Technologies)
2. FDMA, TDMA, Orthogonal-FDMA, CDMA
3. Controlled and Surprise Multiple Access (CSMA) wireless communication
4. None of above

**Quiz-6. Pick the most accurate one. Quality of Service (QoS) refers to the mechanism or feature of IP based networks that provides:**

1. Different priorities to different data flows to assure good performance
2. Top priority to streaming video packets
3. Least priority to web-browsing packets
4. All the statements are correct

**Quiz-7**: **Improved efficiency means less network bandwidth wastage. The method that transmits data efficiently over a shared network is known as:**

1. CS (Circuit Switching)
2. ISDN (Integrated Switching over Data Network)
3. PS (Packet Switching)
4. HPCS (Hybrid Packet-Circuit Switching)

**Quiz-8**: **Whenever Congress enacts a law affecting telecommunications, the FCC starts a proceeding to create the rules and policies required by the new law. Pick the most accurate statement. FCC’s technical rules in wireless communication:**

1. Are generally related to the transmit power levels and radio interference
2. Are usually not associated with the rules for infrastructure or network sharing
3. Are normally not related to the transmit power levels and radio interference
4. A and B both are correct

**Quiz-9**: **The 3rd Generation Partnership Project (3GPP) standards group has developed and maintains LTE/4G high-speed wireless technology. One of the features of the 4G Mobile Communication is:**

1. It is only for a high-quality voice communication
2. It provides two-way security
3. It uses Frequency Division Multiple Access
4. It uses Mobile Switching Centers (MSCs) for routing the calls.

**Quiz-10**: **Mobile communication networks are enabling time-critical applications. In mobile communication networks, Handover is a process in which:**

1. New mobile phones can be received by handing in the used ones
2. Packets are handed over from one router to another in a core network
3. Home Location Register (HLR) hands over the data to the Visiting Location Register (VLR)
4. One base station transfers the session to another base station

**Quiz-11: In LTE/4G Wireless communication network, the EPS (Evolved Packet System) has three major parts, these are:**

1. RAN (Regional Advanced Networks), EPC (Enhanced Primary Cluster-net), LTE (Line Terminal Equipment)
2. Backhaul Network, High-Speed Packet Data Access Network (HSPDAN), and Mobile Switching Centers (MSCs) for routing the calls
3. UE (User Equipment), LTE-RAN (Radio Access Network), and EPC (Evolved Packet Core)
4. Session Initiation Program (SIP), All IP Multimedia Subsystem (IMS), and Electronic Payment Subsystem

**Quiz-12: 5G is about connecting massive devices. Massive MIMO is one of the enabling technologies of 5G RAN. Massive MIMO is the technology that:**

1. The technology that Uses an increased number of transmitting antennas
2. The technology that Employs **M**ultiple **A**gent **S**imulation **S**ystems **i**n a virtual **E**nvironment (MASSIVE)
3. The technology that Provisions **M**ultiple **I**ndependent **M**arket **O**perator (MIMO)
4. The technology that Reduces **M**assive **I**nstallation **M**aintenance and **O**utages (MIMO) in Radio Access Network (RAN)

END of SECTION A

SECTION B

**Question 1.** *(Score 2+2+2+2)*

Explain the followings:

1. Net Neutrality according to the Act 1996
2. The USA Patriot Act, according to the Act of 2001
3. Communications Assistance for Law Enforcement Act (CALEA), according to the Act of 1994, expanded in 2005
4. Cable TV Consumer Protection & Competition Act, according to the Act of 1992

**Question 2**. *(Score 2+3+3)*

As new technologies emerge, the federal government works to ratchet up its regulations. If the technology is sufficiently pervasive, the government creates regulatory arms for it. Radio is one of the earlier examples of this cycle of technological innovation and its regulation. Explain any three flaws of Radio Act of 1927, which was later replaced by the Communication Act of 1934.

**Question 3**. *(Score 3+2+3)*

For any telecom operator, what are the major cost busters? What steps can an operator take to reduce cost, and how has technological advancement contributed to cost reduction?

**Question 4**. *(Score 2+2+2+2)*

What are six brand-new technologies emerging as the foundation of 5G? Name each and provide one-line explanation of each.

END of SECTION B

SECTION C

**Problem** **1**. *(Score 4+2+ 2+2+2) for diagram 4 for service offering with requirements)*

1. What triggered the 1st communication act (i.e., the Act of 1910), and what did it mandate?
2. FCC was established in according to the ACT of 1934. Act of 1934 evolved and was amended several times. However, even the current regulations have several problems. Explain any four problems related to regulations as seen by the current service providers?

**Problem** **2**. *(Score: definition 2.5 +Figure 2.5 +Definition 2.5+ Figure 2.5 + drawback 2)*

1. Define Circuit Switching (CS) and Packet Switching (PS). Draw a figure of each switching technology to explain the concept.
2. One of the drawbacks of PS is that it is delay-sensitive; how is this drawback overcome?

**Problem** **3**. (*Score 5+5+ 2*)

Draw and label the network architecture for 4G and 5G mobile communication systems. Also, explain the Homogeneous and Heterogeneous Handovers in these communication systems?

**Problem** **4.** *(Score 4+ 8)*

In 4G VoLTE (Voice over LTE) is based on the IP Multimedia Subsystem (IMS) architectural framework. The approach results in the voice service (control and media planes) being delivered as data flows within the LTE data bearer. Name the Key Building Blocks of IMS, and draw a simplified, labeled architecture diagram of IMS.

END of SECTION C