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Enrolment No:			
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, December 2022			
Course: Broadband Access Technologies Program: B .Tech ECE Course Code: ECEG 3005 Instructions:		Semester: VII Time : 03 hrs. Max. Marks: 100	
SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q1.	Write the components of ISDN.	4	CO1
Q2.	Two neighbors, who live on the same street, both use ADSL service, but measurements show that one subscriber can download at approximately 1.2 Mbps and the other can download at 2.0 Mbps. Explain.	4	CO1
Q3.	Draw the spectrum allocation for hybrid fiber-coaxial (HFC) network.	4	CO1
Q4.	If you had a choice between DSL and cable modem, which would provide the highest potential data rate, Justify.	4	CO2
Q5.	what are the types of passive optical networks (PON)? Also mention the technical features of those.	4	CO2
SECTION B (4Qx10M= 40 Marks)			
Q6.	Describe the overview of Broadband Access technologies in detail.	10	CO2
Q7.	Discuss the following multiple access techniques used in PON: Time division multiple access (TDMA), Subcarrier multiple access (SCMA), Optical code division multiple access (OCDMA), and wavelength division multiple access (WDMA).	10	CO3
Q8.	(a) A passive optical networks (PON) use a 1:16 power splitter and it operates at 1550 nm, fiber exhibits loss of about 0.25 dB/km. calculate the maximum transmission distance of this network. (b)What is the main difference between FDD and TDD systems? Give examples of TDD and FDD systems.	5+5	CO3
Q9.	(a)Why would a service provider choose Hybrid Fiber Coax instead of Fiber To The Premises? (b)What are the component technologies for Bluetooth?	5+5	CO4

SECTION-C
(2Qx20M=40 Marks)

Q10	<p>(a)Fiber optic cable typically exhibits a probability of bit error of $P_b = 10^{-12}$. A form of wireless modulation, DPSK, has $P_b = 1/2\gamma$ in some wireless channels, where γ is the average SNR. Find the average SNR required to achieve the same P_b in the wireless channel as in the fiber optic cable.</p> <p>(b)Explain the following wireless broadband access networks: Wireless Local Loop (WLL), Local Multipoint Distribution Service (LMDS) and Multi-channel Multipoint Distribution Service (MMDS)</p> <p style="text-align: center;">(or)</p> <p>(c)Describe the Technologies which are available WLL reference model in broadband wireless access Network</p> <p>(d)Design a Transponder at 6/4 GHz in Direct Broadcast Services television also for a <i>direct-to-home</i> DTH in a C-Band.</p>	10+10	CO3
Q11	<p>(a) A signal splitter divides a signal in half, splitting into two equal power levels. If the input to a 3-dB splitter were -7 dBm (in the power domain), then the output on each leg would be -10 dBm. Is this a true statement? What is missing here?</p> <p>(b) Case study: With the growth of data communications and the internet, wireless broadband became a desired alternative to fixed xDSL and cable systems. There were several reasons to choose wireless: some regions did not have a wired infrastructure and the cost of new roll-out was excessive. Moreover, wireless systems could provide blanket coverage much more quickly compared with the time required to build a fixed infrastructure. Accordingly in the late 1990s 2G and 3G standards moved to incorporate fast data connectivity in addition to voice services. These systems initially specified transmission rates of several hundred megabits per second, for example the first 3G release supported a 384 kbps downlink transmission link.</p> <p>At the same time several companies developed proprietary systems based on the OFDM technology. An ecosystem grew over these systems under the auspices of two IEEE standardization groups: 802.16 for wireless metropolitan area networking (MAN) and 802.20, known as Mobile Broadband Wireless Access (MBWA). In essence the two systems were targeting the same market, provision of wireless broadband connectivity using OFDM technology.</p> <p>Of the two standards, 802.16, also known as WiMAX, gained more traction. Several countries rolled out commercial systems to provide broadband access in underserved areas, including Australia, Pakistan and Russia. The first set of 802.16 standards provided a point-to-multipoint star topology architecture through fixed antennas at customer premises. The 802.16 standard did not support mobility at first, however with the growth of the mobile broadband market, the specifications evolved to</p>	8+12	CO4

support a full-fledged mobile system. It was also specified in both TDD and FDD modes to take advantage of a lower competitive barrier in the TDD market. In 2006 Sprint, a major mobile operator in the United States and Clearwire announced they had selected WiMAX to provide broadband mobile service. A number of manufacturers, including Lucent, Nokia and Samsung, developed handsets and network equipment to support the roll out of the WiMAX system.

While WiMAX created a significant buzz in the mobile market in the mid- to late 2000s, it eventually wilted against competition from the 4G LTE standard. Several reasons have been given, including the fact that as LTE grew from the matrix of GSM/WCDMA standards, the network equipment was backwards compatible and therefore posed a lower risk/cost to incumbent operators. Further reasons include slow call set-up speed, and insufficient support at higher layers for call set-up and data packet transfer. A bigger reason perhaps was the unwillingness of major manufacturers to support multiple standards. Costs of research and development, intellectual property protection and management become too large, and a single global standard became the most efficient way forward. By 2012, the main supporters of WiMAX conceded its unviability. Two modes of LTE standards are now set to become universal technologies for provision of wireless broadband

Case Study Questions

- i.** What were the motivations behind the development of wireless broadband systems?
- ii.** What was the initial focus of 2G and 3G systems?
- iii.** What are the two IEEE standards that are developed based on OFDM technology
- iv.** Why was the TDD market more attractive to WiMAX?
- v.** What are the costs associated with supporting two standards for operators and manufacturers?
- vi.** Why was LTE successful in defeating WiMAX as a competitor, and was this inevitable?