Examination report – December 2014 series

2730-023 Advanced Radio Systems

Section 1 – Areas of good performance
Syllabus reference: 1.19 / 1.20 – Explain what is meant by the effective aperture of a parabolic dish antenna. Explain what is meant by free space path loss and calculate the 'loss' given the distance in km and the frequency (or wavelength) of operation. Few candidates were able to explain the meaning of the term effective antenna aperture. Free space loss was reasonably well known. The calculation for free space loss in dB was fairly well done but the calculation for effective antenna aperture wasn't as most did not know the meaning of effective antenna aperture. Syllabus reference: 1.36 – Explain what is meant by noise figure (noise factor) in communication receivers. The section was well done.
Section 2 – Areas for development
Syllabus reference: 1.40 – Explain why it is important that the noise figure should be as low as possible. This section lacked the required detail in many cases. Syllabus reference: 1.39 – Explain why it is important that the first stage of a highly sensitive radio receiver is designed for low internal noise properties. Few candidates gave the required formula for this section. Those that did were unable to adequately use it to explain the necessity for the first stage in a communications receiver having as low a noise factor as possible. Syllabus reference: 1.8 – Explain the importance of the Carrier-to-Interference ratio (C/I) in radio communication systems. No candidate gave the correct definition of Carrier-to-Interference ratio communication systems. No candidate got full marks for by distinguishing between the C/I and the Carrier-to-Noise ratio (C/N), why the C/I is particularly important. Syllabus reference: 1.10 – Explain the need for employing diversity reception techniques in radio systems. There were few candidates who really knew what intermodulation distortion was. Syllabus reference: 1.26 – Sketch the block diagram of a simple FM transmitter and describe the function of each stage. Most candidates didn't perform well in this section. Syllabus reference: 1.41 – Evaluate the need for the following subsystems in communications receivers; squelch, noise limiters, automatic gain control and de-emphasis. In this section, an explanation of the limiter stage in an FM receiver was not called for but the noise limiter in all communication receivers that cater for noise spikes. Syllabus reference: 1.68 – Explain the functionality of the protocols; RLC, MAC, PDCP and BMC.

The explanation of the functionality of the PDCP protocol lacked needed detail in most cases.
Syllabus reference: 1.70 – Explain the concept of macro diversity and the advantages it provides.
Many candidates had just a vague idea of macro diversity. From the diagram of the soft handover provided, most candidates didn't provide a substantial description of the handover procedure.

Syllabus reference: 1.54 – Describe how a code tree can be used to generate multiple OVSF codes and the limitations imposed by the use of higher order codes.
The descriptions given for this section were vague. Few candidates did not know its limitations.

Syllabus reference: 1.63 – Discuss UMTS network planning making reference to the factors; single frequency re-use, OVSF code availability, service availability/QoS, mutual interference and cell breathing.
Mutual interference produced vague answers but the majority of candidates performed well in regards to cell breathing.

Syllabus reference: 1.87 – Calculate link budgets equations for microwave radio relay systems.
The majority of candidates didn't perform well with these calculations.

Syllabus reference: 1.101 – Evaluate the role of Very Small Aperture Satellites (VSATs) in national/international communication.
The descriptions for two applications for VSATs in two-way international communication lacked precision.

Syllabus reference: 1.99 – Describe typical earth station equipment.
Very little was mentioned about TWTs and klystrons in connection with the high power amplifiers needed in earth station transmitting equipment in candidates' answers.

Section 3 – General

Candidates should read questions carefully and correctly and provide sufficient detail when required.