Examination report – June2014 series

2730-016 Radio systems

Section 1 – Areas of good performance
Syllabus reference: 1.5 – Define wavelength. Acceptable definitions were given for this section and most candidates knew the relationship between wavelength, velocity and frequency. Syllabus reference: 1.18 – Construction and radiation pattern of a rhombic antenna. The construction features of the rhombic antenna were fairly well known but the radiation patterns did not fare as well, many candidates limiting their responses to a single plane. Syllabus reference: 1.80 – Block diagram of a Tuned Radio Frequency (TRF) receiver. From the answers given, many candidates failed to correctly read this section and consequentially lost marks. Those who read the section correctly generally secured good marks for the TRF receiver. Syllabus reference: 1.147 – Classes of orbits used by satellites and their characteristics. The features of the required orbit of geostationary satellites were fairly well known.
Section 2 – Areas for development
Syllabus reference: 1.5 – Define wavelength Few candidates knew that frequency is the parameter that always remains constant. Many candidates could not correctly calculate the wavelength. Syllabus reference: 1.96 / 1.97 – Express signal power and noise power levels in dBm and express power gain, attenuation and signal/noise ration in dB. Few candidates successfully completed this section showing that logarithmic units are poorly understood. Syllabus reference: 1.72 – The indirect (Armstrong) method of frequency modulation of a carrier wave. Quite a few candidates gave an accurate diagram for the Armstrong method of producing frequency modulation but the accompanying explanations were lacking in necessary detail. Syllabus reference: 1.34 – Bandwidth requirements for telegraphy, facsimile, Double-sideBand (DSB) telephony and Single-SideBand (SSB) telephony, high quality sound broadcast and colour television. Explanations were expected in this section not statements. Many of them were incorrect. Syllabus reference: 1.14 – Meaning and importance of the driving point impedance of a simple antenna. Uncertainty generally prevailed regarding the driving point impedance of an antenna. Syllabus reference: 1.39 – Calculate approximate range of space wave propagated signals under normal atmospheric conditions. The calculation for this section had nothing to do with satellite systems and not many candidates gave the correct answer. Syllabus reference: 1.56 – Derive expressions for the spectral components of a sinusoidal carrier,

amplitude modulated by a sinusoidal tone.
This section required a mathematical derivation which few candidates managed.

Syllabus reference: 1.57 – Power distribution between the spectral components of the AM wave.
Many candidates were not successful with the calculations in this section.

Syllabus reference: 1.104 – Oscillator tracking error.
It is clear many candidates do not understand Oscillator tracking. Some candidates had a reasonable idea as to what it is but had no clear concept of its cause, namely identical ganged tuning capacitances in oscillator and r.f. sections having to tune over different frequency range ratios. It seemed some candidates had never heard of trimmers and padders for tracking error reduction.

Syllabus reference: 1.127 – The need for error protection over the mobile air interface and state typical examples of schemes used.
The two categories of error protection in mobile radio systems are error detection and error correction. The medium of radio, the air interface, is an extremely unpredictable and varying one. Few candidates took account of such features in their answers. Convolutional coding and turbo coding were the answers for two typical examples of schemes used, but other reasonable responses such as BCH codes were accepted.

Syllabus reference: 1.138 – How cell splitting and/or sectorisation can increase cell capacity.
The section on cell sectorisation required more detail than most candidates provided. Not many candidates realised that, along with the other drawbacks of using sectorisation, there would be an increase in the number of handovers.

Section 3 – General

Care in reading the questions carefully is the main weakness evidenced in the answers of candidates.