Examination report – December 2013 series

2730-023 Advanced radio systems

Section 1 – Areas of good performance
Syllabus reference: 1.13, 1.6 The answers offered to both parts of this question varied from sparse to comprehensive with the marks varying accordingly. Syllabus reference: 1.34 This section was generally done well by many candidates.
Section 2 – Areas for development
Syllabus reference: 1.12, 1.18/20, 1.20 The correct concepts of antenna gain and free space loss was not understood by many candidates. The calculations in regards to gain and loss of a circular parabolic dish failed to provide the right answers in many cases. Syllabus reference: 1.21, 1.23 The three essential needs for frequency stability in radio transmitters were unknown to most; avoidance of adjacent channel interference with other transmitters, international law and the avoidance of continual receiver retuning. Few candidates did well in the phase-locked loop. Few candidates realised that in lock the frequency f_D I zero. Syllabus reference: 1.37, 1.80 Many candidates did not perform well with the calculations in regards to noise figure. The five factors that have to be taken into account when implementing a 3G network are given in the syllabus. Syllabus reference: 1.68 The functions of the MAC and PDCP protocols forming the bulk of this section generally got a good response although somewhat rather vague in many cases. Syllabus reference: 1.52, 1.53 The meaning of orthogonality was not understood by many candidates. Also, few candidates knew the major requirement for codes to remain orthogonal, namely synchronisation. However, the need for synchronisation codes fared better. Syllabus reference: 1.58, 1.70 The reason why the received radio signal in cellular systems is normally multipath appeared to be misread by many candidates. Reflections and diffractions en route was what was wanted. Also, no candidate mentioned the need for time differences being greater than the chip period in order for the RAKE receiver to function efficiently. Few candidates managed the calculations for how each of the micro and macro diversity techniques are implemented in regards to the Universal Terrestrial Radio Access Network (UTRAN).

Syllabus reference: 1.83
Candidates did not perform well with regards to the explanations for the importance of the Energy of bit–to–Noise density ratio (E_b/N_o) in microwave radio relay systems. The derivations for the relationship between E_b/N_o and the Carrier–to–Noise ratio (C/N) to show how the value of C/N can be used to give the value of E_b/N_o lacked explanatory detail.

Syllabus reference: 1.93, 1.94
Candidates did not perform well with regards to the explanations of the importance of the G/T ratio for satellite communication systems. The calculations in this section were also poorly performed.