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City & Guilds

OTS 99

Report on multiple-choice Question Paper

Paper: 7650-001 Radio Amateurs Examination Examination series: December 1996

Syllabus Topic or Objective	Number of items	Comments on performance of candidates
1 Licensing conditions	15	Most of the questions on the licensing conditions were very well answered, but two of them require comment. In a question that asked what kind of messages are allowed, 45% of the candidates said that messages could be sent for general reception by other amateurs. While CQ calls and data messages on computer bulletin boards are exceptions to this, the general rule is that messages shall only be sent to individual amateurs. [1.(7)] Most candidates said that a letter notifying the Secretary of State of a change of the Main Station Address should be sent to the Department of Trade and Industry, whereas it should be sent to Subscription Services Limited. [Note a]
2 Transmitter interference	15	One question asked how frequency instability in a transmitter could be minimised. The correct answer was to use a regulated power supply, but 35% of the candidates thought that correctly loading the p.a. would cure the problem. On a related topic, 46% of candidates said that 'chirp' was caused by the fast rise time of the carrier envelope rather than it being due to poor power supply regulation. Several candidates did not appreciate that the audio bandwidth of a transmitter should be limited to prevent wasteful use of the r.f. spectrum and thought that it was to prevent over modulation. Fewer than a quarter of the candidates answered correctly a question about a parasitic stopper resistor in the anode of a valve p.a. stage. The action of a π-network as a low pass filter when used in a p.a. stage was not appreciated by over half the candidates, many of them thinking it was a band pass filter. 27% of candidates thought that an absorption wavemeter was suitable for checking a transmitter for the presence of frequency instability. It will only measure the approximately frequency and hence is suitable for confirming that a transmitter is operating on the correct band.

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Syllabus Topic or Objective	Number of items	Comments on performance of candidates
continued		
2 Transmitter interference (continued)		In a question that asked what frequency of quartz crystal should be used in a crystal calibrator for checking that a transmitter is operating within the 28.0 to 29.7MHz band, 27% of the candidates chose a 10kHz instead of a 100kHz crystal.
3 Electromagnetic compatibility	15	One question asked which device caused narrow band interference. Many candidates (27%) continue to think that a commutator motor causes narrow band interference. A simple demonstration of an electric drill and general coverage receiver would confirm this misunderstanding. The purpose of a balun was not generally understood by many candidates. A 1:1 balun is used to match a balanced antenna to an unbalanced feeder (or vice versa) and will hence limit the flow of r.f. currents in the outer (screen) of coaxial cable. 40% of the candidates thought that an r.f. filter in the mains supply to a transmitter was to prevent mains borne interference affecting the transmitter rather than to prevent r.f. energy from the transmitter entering the public electricity supply.
General comments on the paper		The questions that caused particular difficulty with candidates are detailed above. It is hoped that the comments will assist instructors and those taking future examinations. Despite the above comments, the overall performance was about average for Paper -001. The report was prepared and the paper moderated from the analysis of 338 candidates whose answer papers were returned promptly to City and Guilds. The results for these candidates will be among the first to be advised to Examination Centres. Of the 338 candidates, 249 (73.7%) were successful.

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Report on multiple-choice Question Paper

Paper: 7650-002 Radio Amateurs Examination Examination series: December 1996

Syllabus Topic or Objective	Number of items	Comments on performance of candidates
1 Operating procedures	9	Many candidates were unsure how to react if they were called by a citizen band operator. The correct action would be *not* to reply, but the incident may be recorded in the station log. Most candidates said they would report the incident to the Radio Investigation Service, but this would be unnecessary unless they were requested to do so by the R.I.S. The purpose of band planning was not clear, 42% of the candidates thinking that it was designed to prevent interference to other radio services. The principal purpose is to enable the maximum number of amateur communications of all modes to be accommodated in the bands. The other questions in this section were well answered.
2 Electrical theory	6	Only half the candidates answered correctly an Ohm's Law calculation with resistors in a series and parallel combination. In another question candidates did not know how to convert a frequency of 21MHz to a period of 0.0476×10^{-6}s.
3 Solid state devices	7	In a question that asked about the main advantage of Class A over Class B amplifiers, many candidates thought that Class A was more efficient. In fact, Class A is least efficient, but provides lower distortion. In a simple circuit comprising a transistor with a resistive collector load and an emitter resistor, candidates were asked to calculate the power dissipated in the transistor. Many candidates calculated the total power dissipated in the circuit as a whole rather than that in the transistor alone.
4 Receivers	7	30% of the candidates answered that an r.f. amplifier operates at the intermediate frequency. The correct response was that it increases the signal to noise ratio. A question about image interference required a calculation, and two-thirds of the candidates were unable to determine the intermediate frequency.

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Syllabus Topic or Objective	Number of items	Comments on performance of candidates
continued		
4 Receivers (continued)		In a question about the bandwidth of an A3E transmission, less than one third of the candidates knew that it was equal to twice the highest audio frequency modulating the transmission.
5 Transmitters	8	A question on a frequency synthesiser caused some difficulty, many candidates identifying a stage as a mixer rather than the phase detector. It was not appreciated by many candidates that a broadband linear p.a. stage offers operator convenience but does not necessarily provide good harmonic suppression. Many candidates misunderstood the blocking capacitor in a π-network p.a. circuit to be a series resonant tuned circuit with the inductor.
6 Propagation and antennas	9	The effect of sloping the radials of a ground plane antenna was not understood by many candidates. In a question about feeders a disappointing number of candidates recognised the open wire line described as having a typical characteristic impedance of 600Ω.
7 Measurements	9	A circuit that involved switching in a 10V voltmeter with a sensitivity of 20,000Ω/V caused some difficulty. Many candidates did not understand what effect this would have on the total current in the circuit. In a practical question on how to measure the frequency of an incoming signal, many candidates thought that this could be done merely by coupling a digital frequency meter to the receiver antenna. A receiver whose calibration is checked against a crystal calibrator would be necessary.
General comments on the paper		This report comments on the question in which any distractor (wrong answer) attracted responses from 25% or more of the candidates. As well as giving an indication as to where candidates may have gone wrong, the comments are intended to provide guidance to instructors and to those taking the examination in the future. The paper was moderated and the report prepared from an analysis of the results of 349 candidates that were available at the time of writing. Of the 349 candidates, 240 were successful. The December 1997 Radio Amateurs Examination will be the final examination in its present form. It will be the last opportunity for candidates who have previously been successful in only one paper to retake the paper they still need to pass. From May 1998 the Radio Amateurs Examination will comprise a single paper of 80 questions. There will be 25 questions in the first part of the paper which will cover Licensing conditions and operating procedures and practices. Candidates must be successful in part 1 of the paper to be successful in the examination as a whole.