

DEPARTMENT OF COMMUNICATIONS

(A)

RADIOCOMMUNICATION OPERATOR'S GENERAL CERTIFICATE OF PROFICIENCY

BROADCAST STATION OPERATOR'S CERTIFICATE OF PROFICIENCY

SECTION J (RADIO THEORY)

JUNE 1983

(TIME ALLOWED - THREE HOURS)

NOTE ONLY SEVEN QUESTIONS to be attempted. Credit will not be given for more than SEVEN ANSWERS. All questions carry equal marks.

\* QUESTION ONE IS COMPULSORY

1. (a) Draw a circuit diagram of 5 kW broadcast transmitter employing triodes in the final stage. The high level modulator and power supply units should also be shown.  
(b) Discuss the bias and modulation arrangements for the final stage indicating the reasons for your choice of the methods employed.
2. (a) Draw a schematic diagram of a typical antenna tuning unit suitable for matching the transmission line to the vertical mast antenna of a medium frequency broadcasting station.  
(b) Explain the operation and adjustment of the tuning unit.
3. (a) Aided by a circuit diagram, describe the operation of a monostable multivibrator.  
(b) Why is it necessary to employ a triggering pulse with a monostable and not with an astable multivibrator?
4. (a) Explain under what conditions neutralization of a radio frequency amplifier is necessary.  
(b) Draw a circuit diagram showing a method of neutralizing a single-ended RF amplifier and explain the condition which exists when neutralization is obtained.  
(c) Describe in detail, a practical method you could use to check the neutralization of an RF amplifier.
5. (a) Discuss the factors which affect the field strength of signals radiated from a medium frequency broadcast transmitter, at a distance of 3km and 300km from the station.

(b) At a certain distance from a broadcast transmitter the field strength of the fundamental frequency is measured as 200 mV per metre. Calculate the field strength of the second harmonic at that point if it is 60 dB below the fundamental. Show all working.

6. Explain with the aid of diagrams including typical signal levels, how you would measure the performance of a studio line audio amplifier in relation to:

- (i) overall gain
- (ii) frequency response
- (iii) distortion
- (iv) noise

7. (a) Draw the block diagram of a stereo sound generating system used to modulate the exciter stage of an FM broadcast transmitter and identify appropriate signals and frequencies.

(b) Explain in broad terms how the composite stereo signal is generated.

8. (a) Explain why a limiter is needed in an FM receiver.

(b) With the aid of a circuit diagram explain the operation of a typical FM limiter stage.

9. (a) With the aid of a sketch and a circuit diagram describe the construction and operation of a VU meter.

(b) What special characteristics distinguish a VU meter from a normal moving coil meter?