POSTAL AND TELECOMMUNICATIONS DEPARTMENT

AMATEUR OPERATORS' CERTIFICATES OF PROFICIENCY

SECTION M (Theory) 23/FEBRUARY, 1978

(Time Allowed - 2½ Hours)

NOTE: - SEVEN questions only to be attempted. Credit will not be given for more than SEVEN answers. All questions carry equal marks.

1. (a) Explain the fundamental difference between frequency modulation and amplitude modulation.

   (b) With the aid of a circuit diagram, explain the theory of operation of the discriminator stage of a receiver suitable for reception of frequency modulated signals.

2. (a) With the aid of a circuit diagram describe the operation of each stage of an amateur transmitter capable of operating in the 14 MHz (20 metre) band.

   (b) Explain how you would tune each stage of the transmitter.

3. Draw the circuit and briefly explain the operation of a grounded grid R.F. stage of a receiver operating in the VHF range. With reference to operation on frequencies of the order of 144 MHz, list any advantages this type of amplifier may have over that of the normal type.

4. (a) With the aid of a suitable sketch, describe the construction and principle of operation of a moving-coil (dynamic) type microphone.

   (b) Compare the frequency response and output level of a moving-coil type microphone with a carbon granule type microphone.

5. (a) With the aid of a circuit diagram describe the operation of a full-wave H.T. power supply which uses silicon rectifiers.

   (b) Discuss any advantages and disadvantages silicon solid-state rectifiers may have when compared with the vacuum-tube type.

6. (a) What do you understand by the term "standing wave ratio" when applied to an R.F. transmission line?

   (b) How would you detect the presence of standing waves on a transmission line?

   (c) What does a high SWR on a transmission line feeding an antenna indicate? How can the S.W.R. be reduced?

7. (a) Assisted by a circuit diagram describe a variable-frequency oscillator (VFO) suitable for use in the 3.5 MHz band.

(b) With reference to a V.F.O., discuss the factors upon which the stability of the generated frequency depends.

8. (a) With the aid of a circuit diagram describe the operation of a product detector suitable for use in an SSB receiver.

(b) What ratio of BFO to signal input voltage to the product detector do you consider satisfactory to obtain good resolution of the SSB signal?

9. Two resistors of 10 and 30 ohms respectively are connected in series and placed across a 24 ohm resistor, a supply voltage of 30 volts is connected across this combination.

Calculate:-

(i) the total current drawn from the supply; and
(ii) the power dissipated in each of the three resistors