UNIVERSITY OF NOTTINGHAM

FACULTY OF PURE SCIENCE

FIRST YEAR PART I EXAMINATION, 1966

ELECTRONICS (ii)

MONDAY June *6th* 2.30 — 5.30

Answer THREE *questions from Section* A
and TWO *questions from Section* B

SECTION A

1. Describe fully the operation of a Wien bridge oscillator.

2. Explain what is meant by harmonic and phase distortion. Show how these arise in a single stage amplifier. Discuss the effect of negative feedback on the magnitudes of the two forms of distortion.

3. Describe the operation of a monostable multi-vibrator and explain how it may be used in a circuit to delay a negative going pulse.

4. Explain what is meant by frequency and amplitude modulation. Describe a circuit that can be used to recover audio frequency information from a frequency modulated signal of constant voltage amplitude.

5. Describe the operation of a phase sensitive detectorI circuit incorporating a phase shifting circuit.

6. Discuss the difficulties encountered in d.c. amplification and explain the operation of a chopper amplifier.

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7. Describe the construction and characteristics of tetrode and pentode valves and explain the reasons for their development. Indicate briefly the relative advantages and disadvantages of the two types of valve.

8. What is meant by velocity modulation? Show how this principle is used in the double cavity klystron. Explain how the difficultv of the exact tuning of cavities has been overcome in the reflex klystron.

9. Describe a hard valve linear time base circuit, explaining carefully how the linearity is achieved. How can the time base be synchronised by the application of an external signal?

10. Explain the physical processes which give rise to Johnson and shot noise. Derive an expression for the r.m.s. Johnson noise voltage developed across a resistor.

Calculate the r.m.s. noise voltage developed across a 1 MΩ resistor at a temperature of 25° C within the frequency range 50 cs to 15 kc/s.

(Boltzmann's constant = 1 38 x 10^{-23} joule deg^{-1} .)

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