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D 4144

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Second Semester

Mechatronics Engineering

EC 1161 — ELECTRONIC DEVICES AND CIRCUITS

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. In the network shown in Fig. 1, find the equivalent resistance between the terminals A and B.

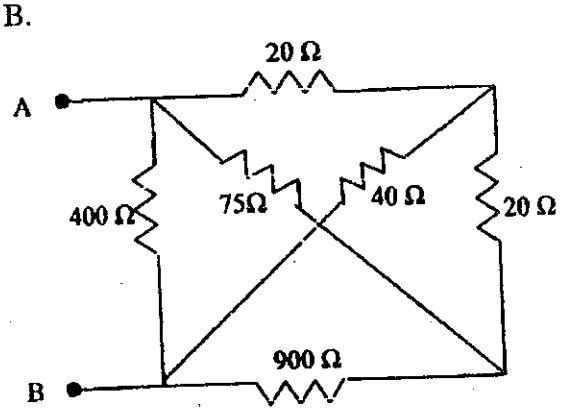

Fig. 1

2. State Norton's theorem.

3. Distinguish between intrinsic and extrinsic semiconductor.

4. Draw the fixed biased transistor amplifier circuit and obtain its stability factor.

5. Draw the circuit of half-wave rectifier and give its input and output waveforms.

6. Discuss the function of a voltage multiplier circuit.

7. State Barkhasen criterion for sustained oscillations.

8. Define desensitivity factor of feedback amplifier.

9. Define CMRR of an operational amplifier.

10. How op-amp can be used as a comparator? Draw the necessary waveforms.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Find the voltage V_{ab} in the network shown in Fig. 2. (8)

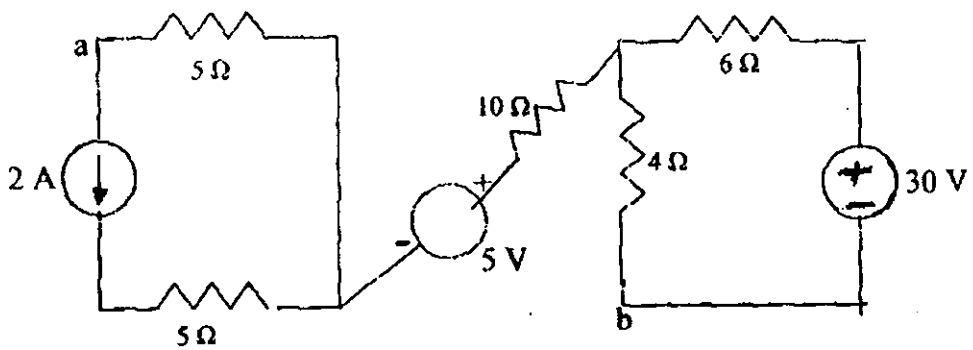

Fig. 2

(ii) Find the voltage across the 2 Ω resistor by superposition principle in Fig. 3. (8)

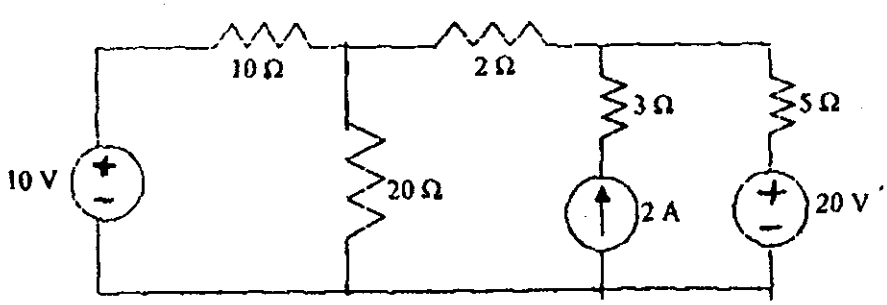

Fig. 3

Or

(b) (i) Find the Z -parameters of the two-port circuit in Fig. 4. (8)

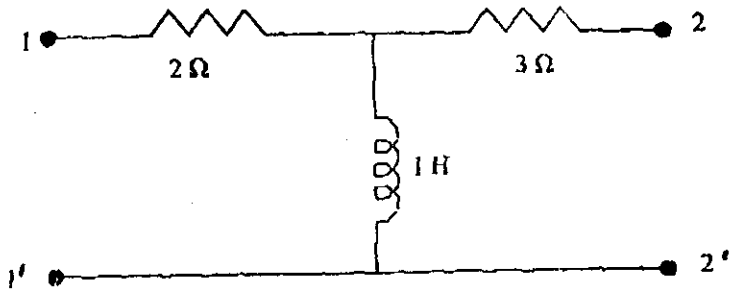

Fig. 4

(ii) Two two-port networks a and b with transmission parameters T_a and T_b are connected in cascade. Given $I_{2a} = -I_{1b}$ and $V_{2a} = V_{1b}$, find the T -parameters of the resulting two-port network. (8)

12. (a) (i) Determine the ac resistance for a semiconductor diode having a forward bias of 200 mV and reverse saturation current of 1 μ A at room temperature. (8)

(ii) What is zener effect? Explain the function of a zener diode and draw its characteristics. (8)

Or

(b) (i) Draw the biasing arrangement for a CE transistor to operate in cut-off, active, and saturation regions. Also define α and β of a transistor and give the relation between them. (8)

(ii) Describe the construction, principle of operation and characteristics of an N-channel JFET. (8)

13. (a) (i) Draw the circuit of a double diode clipper which clips at two independent levels V_{R1} and V_{R2} with $V_{R2} > V_{R1}$ and explain with necessary waveforms. (8)

(ii) Explain the working of a series voltage regulator. (8)

Or

(b) (i) Explain the self-bias arrangement for a transistor amplifier. (8)

(ii) Compare BJT and FET. (8)

14. (a) (i) Draw the h-parameter model of a transistor and define the h-parameters. (8)

(ii) Explain the advantages and disadvantages of negative feedback. (8)

Or

(b) (i) Explain the operation of Hartley oscillator and derive its frequency of oscillation. (8)

(ii) A voltage series feedback amplifier has a voltage gain of 500, and input and output resistances of 3 kΩ and 20 kΩ respectively without feedback. Find the gain and input / output resistances with feedback when 10% of output is feedback to the input. (8)

15. (a) (i) Draw the internal circuit of op-amp and describe the concept of virtual ground. (8)

(ii) Draw the circuit of op-amp in the following configurations and derive the gain expression in each case.

(1) Non-inverting amplifier

(2) Voltage follower. (8)

Or

(b) (i) Explain the working of Wien Bridge oscillator with a neat sketch. (8)

(ii) What is a multivibrator? How is it classified as astable, monostable, and bistable? What is the application of each type? (8)
