Reg. No. : | | | | | | | | | | | |

S 4811

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Annual Pattern — First Year

Mechatronics Engineering

EC 1X12 — ELECTRONICS DEVICES AND CIRCUIT

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Superposition Theorem.

2. Find the z parameters of a two-port network for which

   $V_1 = V_2 + I_2$ and $I_1 = I_2 + V_1 + V_2$.

3. How does the energy band structure of a semiconductor differ from that of a conductor and an insulator?

4. Compare JFET with BJT.

5. Define Peak Inverse Voltage (PIV) of a rectifier.

6. A 10 V zener diode is used to regulate the voltage across a variable load resistor. The input voltage varies between 13 V and 16 V and the load current varies between 10 and 85 mA. The minimum zener current is 15 mA. Calculate the value of the series resistance R.

7. Sketch the h-parameter equivalent circuit of a single stage transistor amplifier operating in CB configuration.

8. What is an Oscillator?

9. What are the ideal characteristics of OP-AMP?

10. State the Barkhausen conditions for oscillations.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Use Norton's theorem to find V_0 in the circuit in Fig. 1.

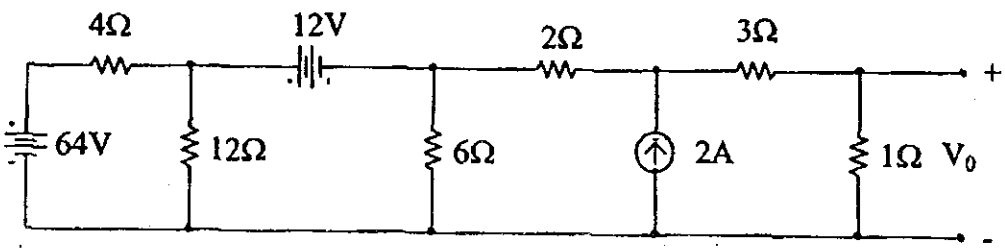

Fig. 1 Qn 11(a) (i)

(ii) Using star-delta transformation, find the current through 4.5 kΩ resistor in Fig. 2.

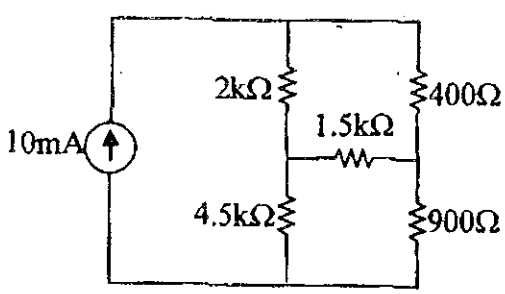

Fig. 2 Qn 11(a) (ii)

Or

(b) (i) Determine the ABCD parameters for the network in Fig. 3.

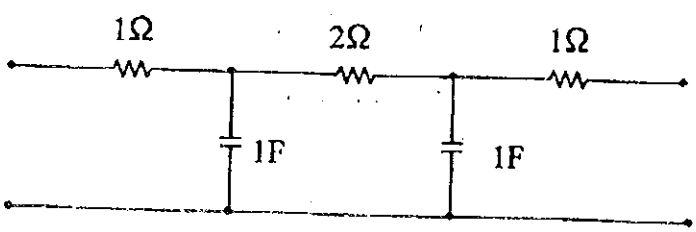

Fig. 3 Qn 11(b) (i)

(ii) Determine the Z parameter for the network shown in Fig. 4.

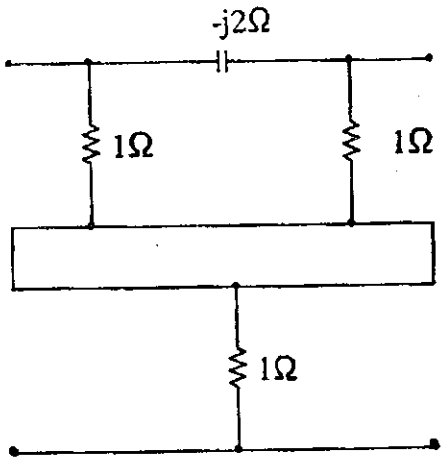

Fig. 4 Qn 11(b) (ii)

12. (a) (i) With a neat sketch, describe the action of a PN junction diode under forward and reverse bias.

(ii) Explain the mechanism of biasing of a transistor by collector feed back bias.

Or

(b) (i) With a neat sketch, explain the input and output characteristics of junction transistor in CE configuration.

(ii) Explain how the constructional feature of a MOSFET differs from that of a JFET.

13. (a) (i) With a neat sketch, explain the working of a Half Wave Rectifier (HWR) using diode.

(ii) With a neat sketch, explain the action of a clipper and a clamper circuit.

Or

(b) (i) With a neat sketch, explain the equivalent circuit of an ideal zener diode in the breakdown region.

(ii) Explain how a zener diode maintains constant voltage across the load.

14. (a) (i) Give the equivalent circuit of a typical small signal amplifier. Obtain expressions for voltage gain and current gain.

(ii) Discuss the effect of negative feedback on gain, bandwidth and distortion.

Or

(b) (i) Derive an expression for frequency of oscillation of a Colpitts Oscillator.

(ii) Explain the operation of a Hartley oscillator.

15. (a) (i) Explain how an OP-AMP can be used as (1) an integrator and (2) a precision amplifier.

(ii) Briefly explain the operation of a Schmitt trigger using OP-AMP and give some applications.

Or

(b) (i) With a neat sketch, explain the RC phase shift oscillator and obtain an expression for frequency of oscillation.

(ii) Explain the working of a Monostable multivibrator circuit with a neat sketch. Also draw its output waveforms.
