2016

ELECTRONICS

[Honours]

PAPER – III

Full Marks : 90

Time : 4 hours

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary
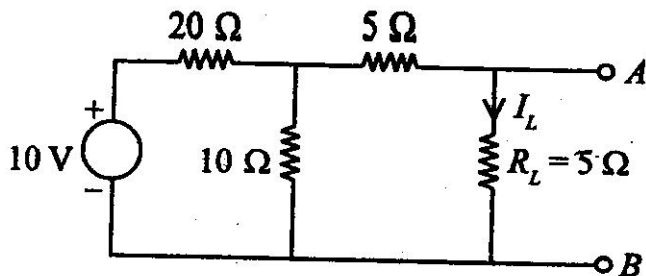
[OLD SYLLABUS]

GROUP – A

Answer any **two** questions :   15 × 2

1. (a) State and prove the Thevenin's theorem.

(b) Using Thevenin's theorem calculate R_{AB} and V_{AB} for the following circuit.

Also determine I_L following through the Load resistance R_L.

(c) If an voltage source V_0 is connected to a series LR circuit at $t = 0$, determine $i(t)$.

$$(2 + 3) + (2 + 2 + 1) + 5$$

2. (a) Indicate different current component present in a P-N-P transistor. Use suitable diagram in support of your discussion.

(b) Prove that $I_C = \beta I_B + (1 + \beta) I_C$, where the symbols have their usual meanings.

(c) Indicate different break-down mechanisms present in a reverse biased P-N junction. What do you mean by Impact ionization ?

(d) With a neat sketch describe the principle of operation of a JFET.

(e) Discuss how 'h' parameters of a transistors can be determined from its characteristics.

$$3 + 3 + (1 + 2) + 3 + 3$$

3. (a) Explain the principle of operation of a CMOS inverter with suitable circuit diagram.

(b) Discuss with suitable circuit diagram how an wien bridge oscillator works.
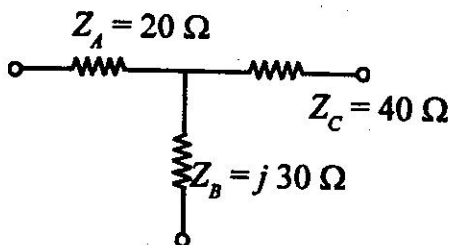
(c) Write a short note on UJT.　　　$4 + 7 + 4$

GROUP – B

Answer any five questions :　　　8×5

4. What are the fundamental differences among class A, B and C amplifiers ? With proper circuit diagram discuss the principle of operation of a single fund amplifier.　　　$3 + 5$

5. The arm impedences of a T network are as

follows, calculate the arm impedences of an equivalent π network.

8

$Z_A = 20\ \Omega$

$Z_C = 40\ \Omega$

$Z_B = j\ 30\ \Omega$

6. For a silicon controlled rectifier derive the expression of anode current in forward conduction mode.

8

7. Derive the expression of built-in-potential and depletion layer width in connection with a P-N junction diode.

$4 + 4$

8. Draw the 'h' parameter equivalent circuit of a transistor. Derive the expression of mid frequency gain.

$3 + 5$

9. Derive the expression of resonant frequency of the following series LCR circuit. What do you mean by Q factor of the circuit?

$5 + 3$

(Continued)
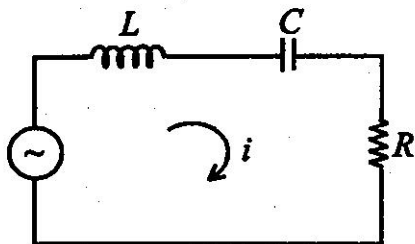
10. Briefly discuss on Subeek, Peltier and Thomson effects. What is thermo-electric power ? Indicate several uses of thermo-couple. $(2 \times 3) + 1 + 1$

11. Discuss how a differential equation can be solved using an operational amplifier.   8

GROUP — C

Answer any **five** questions : 4×5

12. Discuss the working principle of a push-pull amplifier.   4

13. Explain how a negative resistance is achieved in a GUNN Diode.   4

14. Explain the operating principle of a CMOS NOR gate.   4

15. What do you mean by SMPS ? Indicate some of its uses.   2 + 2

16. Write down some characteristics of a ideal Op-Amp. What is CMRR ?   2 + 2

17. What is light emitting diode ? Why silicon is not preferred as LED material ?   2 + 2

18. Write down the principle of operation of a phase -shift oscillator.   4

19. For a field effect transistor derive the relationship $\mu = g_m.r_d$, where the symbols have their usual meanings.   4

20. Explain the working principle of a schmitt trigger using an Op-Amp.   4

[*Internal Assessment* : 10 Marks]

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