

(i) Printed Pages: 4 Roll No. ....

(ii) Questions : 9 Sub. Code : 

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Exam. Code : 

0	4	7	2
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M.Sc. Physics 1<sup>st</sup> Semester

(2124)

ELECTRONICS-I

Paper : PHY-8014

Time Allowed : Three Hours] [Maximum Marks : 60

Note :— Attempt FIVE questions in all, selecting ONE question from each unit (Unit-I to Unit-IV). Question No. 9 of Unit-V is compulsory.

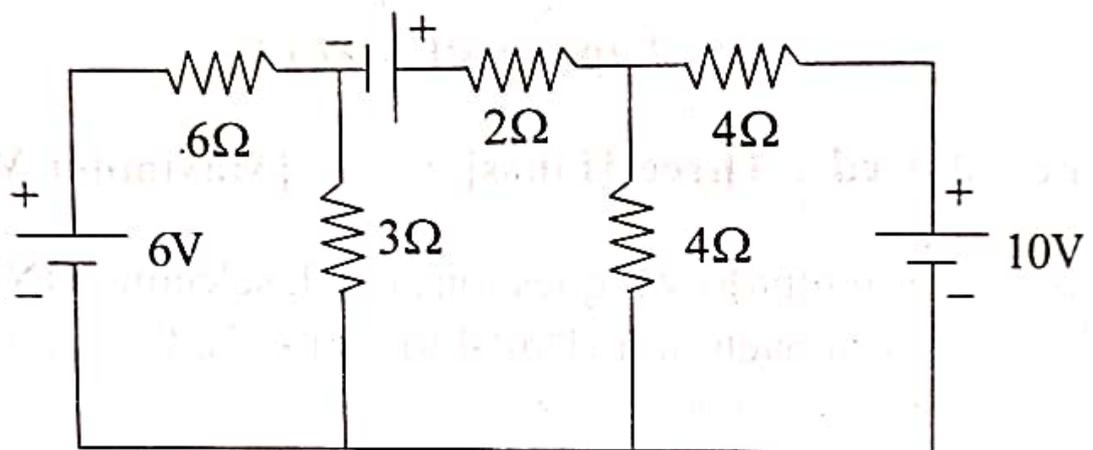
### UNIT-I

1. (a) Derive the expression for junction capacitance of p-n junction with the relationship for the forward and reverse potential across the junction. Explain the concept of the varactors. 7
- (b) Explain the idea of energy band theory in semiconductor devices. Give usefulness of Fermi level. Also discuss position of Fermi level in n and p type of semiconductors. 5
2. (a) Explain construction details and mechanism of Laser diode with help of suitable diagram. Discuss how its working is different from light emitting diode for similar applications. 7

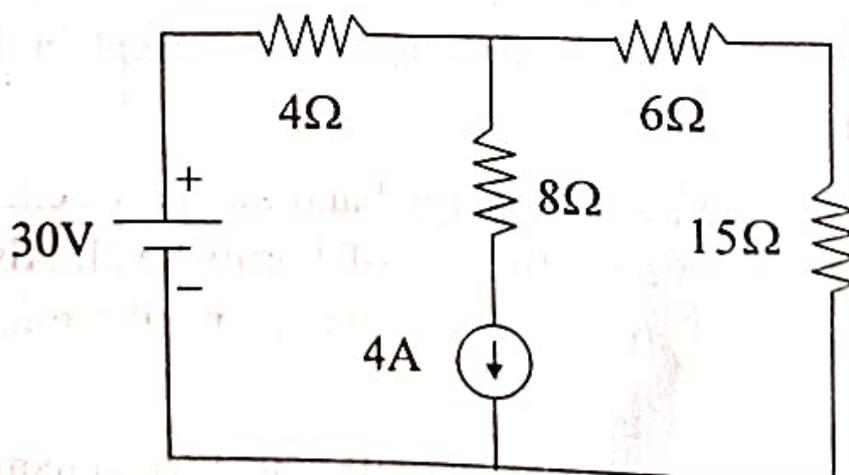
- (b) Discuss the negative resistance region of the IMPATT diode with suitable diagrams. 5

### UNIT-II

3. (a) What is mesh analysis? Explain how it helps in calculating branch current in circuit containing resistance, current sources and independent voltage sources. 6
- (b) Calculate the voltage drop across  $2\Omega$  resistance using nodal analysis. 6



4. (a) Using Norton's theorem, calculate the current flowing through  $15\Omega$  resistance in the network. 6



- (b) Explain the working of Band Pass (BP), Band Reject (BR) and All Pass (AP) filter circuit network. Also draw output wave forms for above filters. 6

### UNIT-III

5. (a) Discuss the application of operational amplifier as differentiator and integrator. Also calculate the output voltages in operational amplifier differentiator for input 6 mV, 1 KHz sinusoidal signal. Given  $R = 50 \text{ K}\Omega$  and  $C = 2 \mu\text{F}$ . 7
- (b) Discuss the operational amplifier as analog computational amplifier to solve the differential equation of the order 2. 5
6. (a) What is the differential amplifier ? Draw its transfer characteristics and derive expression for transconductance. 6
- (b) Discuss the 555 timer based circuit for astable multivibrator. Draw waveform for output. Derive the expression for time period. 6

### UNIT-IV

7. (a) Explain working of pnpn power devices ? Also show its basic characteristics. 6
- (b) Discuss the economy of power saving in DSBSC. Give DSBSC transmitter for the communication purpose. 6
8. Give the short notes on following in communication system :
- (a) Code Division Multiple Access (CDMA) along with example.
- (b) Phase Shift Keying (PSK) for digital modulation and demodulation. 6,6

## UNIT-V

### (Compulsory Question)

9. Give the point answers of following questions :
- Define the carrier life time. Give its importance.
  - What is significance of photoconductivity in semiconductor devices ?
  - What is the significance of roll off frequency in the filter circuit ?
  - Define the hybrid matrices for the two port network.
  - If the differential mode gain is  $10^4$  times more than common mode gain. Find CMRR in DB units.
  - What is the use of FSK in telephone communication system ?

6×2=12