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

Question Paper Code : X 60438

B.E./B.Tech. DEGREE EXAMINATIONS, NOV./DEC. 2020
Second Semester
Electronics and Communication Engineering
EC 2151/EC 25/10144 EC 205/080290007/EE 1152 – ELECTRIC CIRCUITS AND ELECTRON DEVICES
(Common to Computer Science and Engineering, Biomedical Engineering, Medical Electronics Engineering and Information Technology)
(Regulations 2008/2010)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. State Kirchhoff's voltage law.

2. State Superposition theorem.

3. A 2 kΩ resistor in series with a 0.1 μF capacitor is given an input of 10 V rms sine wave signal at 500 Hz. Determine the total impedance.

4. Write the expression for the resonant frequency of a RLC series circuit.

5. Draw energy band diagram of semiconductor.

6. Define diffusion capacitance.

7. Define α_{dc} and β_{dc} of a transistor.

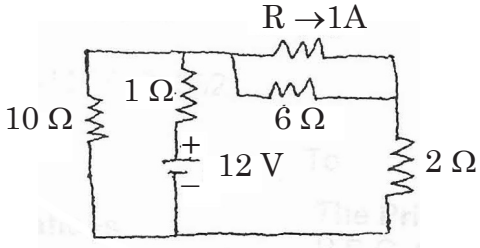
8. Draw the structure and symbol for a n-channel JFET.

9. What is tunnelling phenomenon ?

10. Name any two applications of photoconductive cells.

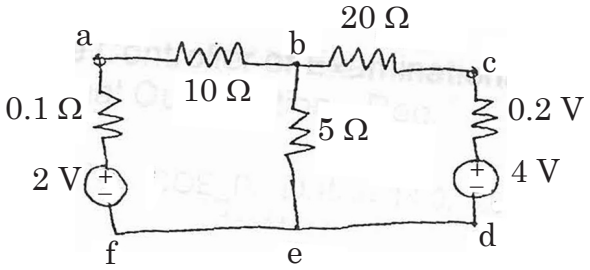
PART – B **(5×16=80 Marks)**

11. a) Find the value R so that 1A current would flow in it, for the network in the figure shown below. **(16)**



(OR)

b) State Norton's theorem and find the current through branch b-e using Norton's theorem. **(16)**



12. a) Derive an expression for the current response of RLC series circuit with sinusoidal excitation. From the results, discuss the nature of transient and steady state responses. Comment on the phase angle involved. **(16)**

(OR)

b) i) Explain the concept of half power frequencies of a series RLC circuit. **(4)**

ii) A series RLC resonance circuit has R = 100 Ω, L = 0.5 H, C = 0.4 μF. Find the resonant frequency, the half power frequencies and the bandwidth. **(4)**

iii) Derive the quality factor of a parallel RLC circuit at resonance. **(8)**

13. a) i) With the help of energy band diagram of PN junction diode, derive the expression for the contact difference of potential. **(6)**

ii) Consider a germanium PN junction at 300°K with doping concentration $N_A = 1.5 \times 10^{18}\,cm^{-3}$ and $N_D = 2 \times 10^{15}\,cm^{-3}$ in the p and n sides of the junction respectively. Assuming the intrinsic carrier concentration of germanium $n_i = 2.5 \times 10^{13} cm^{-3}$ at 300°K, determine the contact potential across the junction. **(4)**

iii) The resistivities of the two sides of an abrupt germanium diode are 2 Ω cm (p side) and 1 Ω cm (n side) at 300°K. The mobility of electrons and holes in germanium are $\mu_n = 3800\ cm^2$ /V sec and $\mu_p = 1800\ cm^2$ /V sec respectively. Calculate the height E_0 of the potential energy barrier. **(6)**

(OR)

b) What is meant by Diffusion Capacitance of a PN junction diode ? Derive an expression for the Diffusion Capacitance in terms of the current and the mean life time for holes. **(16)**

14. a) i) Draw and explain the characteristics of PNP transistor in CB configuration. **(8)**

ii) Compare CB, CE and CC transistor configurations. **(8)**

(OR)

b) i) Describe the construction, operation and characteristics of N-channel JFET. **(8)**

ii) Draw the structure of N-channel depletion type MOSFET and explain its operation and characteristics. **(8)**

15. a) i) Draw the VI characteristics of SCR and explain its operation. Explain the terms Holding current and Latching current. **(10)**

ii) Explain the principle of operation of photo transistor. **(6)**

(OR)

b) Write short notes on :

i) Photodiode **(5)**

ii) LED **(5)**

iii) UJT. **(6)**

.