

FAKIR CHAND COLLEGE
ELECTRONIC SCIENCE – GENERAL - 2020

Part-I

Full Marks-100

Time- 3 hours

Group-A

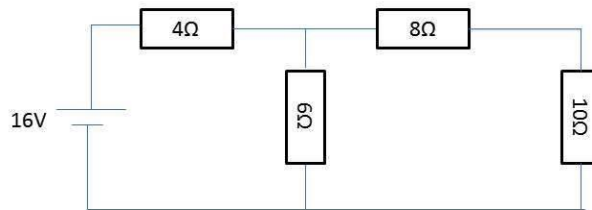
Answer question no.1 and any four questions, taking 2 from each unit-I and unit-II

1. Answer any 5 questions: **2x5**

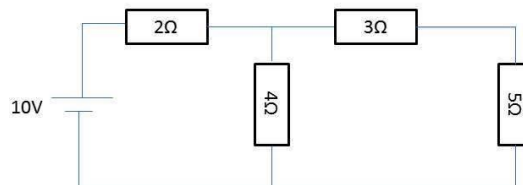
- (a) What are the differences between p-type and n-type semiconductors?
- (b) How much power can a power supply deliver to a load if it is rated as 4V, 5mA?
- (c) State Norton's theorem.
- (d) State Thevenin's theorem.
- (e) What is the trans conductance of FET?
- (f) What are ideal voltage and current sources?
- (g) What do you mean by barrier potential of P-N junction?
- (h) What is Zener breakdown?

Unit-I

2. (a) State and prove maximum power transfer theorem. 2+4
(b) Find the current through the 6Ω resistance by using superposition theorem. 4



3. State Kirchhoff's voltage and current law. Apply KVL and KCL to find the current through 5Ω resistor. 4+6



4. (a) What are mesh and node in an electrical network? Explain the mesh and node methods of analysis. 6
 (b) What are active and passive elements of a circuit? 2
 (c) Distinguish between linear and non-linear circuit elements? 2
5. An inductor L, a capacitor C and a resistor R are connected in series with an AC voltage source. Find the expression for current through the resistor as a function of frequency. At what frequency the current will be maximum? 8+2

Unit-II

6. (a) What is Hall-effect? 2+4+4
 (b) Show for an n-type semiconductor, the Hall coefficient R_H is given by $R_H = \frac{1}{ne}$ where n is the electron concentration and e is electronic charge.
 (c) An n-type Ge sample has donor density of $10^{21} /m^3$. It is arranged in a Hall Effect experiment having $B=0.5$ Webers/ m^2 and $J=500$ Amp/ m^2 . Find the Hall voltage if the sample is 3 mm thick, where B is magnetic flux density and J is the current density.
7. (a) Why the base of a transistor is made thin with low doping concentration?
 (b) Define α and β for a transistor. Establish the relation between them.
 (c) Draw the circuit and output characteristic curves of a p-n-p transistor in CE mode. Show the different operating regions.
 (d) What is Early effect? 2+3+3+2
8. (a) What are the advantages of FET over a BJT? 3
 (b) What is mutual conductance of a FET? 3
 (c) Draw and explain the drain characteristics of an n-channel JFET. 4

Group-B

Answer question no.9 and any four questions, taking 2 from each unit-I and unit-II

9. Answer any 5 questions: **2x5**
 (a) What is load regulation?
 (b) Define class B power amplifier.
 (c) What is slew rate? What should be its ideal value?
 (d) What is Pi filter?
 (e) What is CMRR of an OPAMP?
 (f) Draw unity gain buffer circuit using OPAMP.
 (g) What is the PIV rating of full wave rectifier?
 (h) Draw the circuit of a lowpass active filter.

Unit-I

10. Draw the circuit diagram of full wave rectifier. Explain its operation with the help of voltage waveforms. 4+6
11. Using the h-parameter model of transistor amplifier, find the expression for current gain, input impedance and voltage gain. 3+4+3
12. What is fixed biasing of a transistor? Explain with a circuit diagram. Calculate its stability factors. 2+3+5
13. Draw the circuit diagram of Hartley oscillator and derive the condition for a sustained oscillation. 4+6

Unit-II

14. What are the characteristics of an ideal OPAMP? Why OPAMP is generally not used in open loop mode? Draw the circuit diagram of a integrator and explain its operation. 4+2+4
15. What is D/A converter? Draw and explain a 4 bit D/A converter with binary weighted resistors. 3+7
16. Why offset null is required? What do you mean by offset voltage and offset current of an OPAMP? Explain how an OPAMP can be used as a summing amplifier. 2+4+4