Code: D-06 **Subject: BASIC ELECTRONICS**
Time: 3 Hours **Max. Marks: 100**

NOTE: There are 11 Questions in all.

- **Question 1 is compulsory and carries 16 marks. Answer to Q. 1. must be written in the space provided for it in the answer book supplied and nowhere else.**
- **Answer any THREE Questions each from Part I and Part II. Each of these questions carries 14 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or best alternative in the following: (2x8)

a. Three capacitors of value $8\mu F$, $16\mu F$ and $32\mu F$ are connected in series, the total capacitance will be

(A) $32/7\ \mu F$. **(B)** $7.32\ \mu F$.
(C) $56\ \mu F$. **(D)** $32\ \mu F$.

b. The following components are all active components

(A) a resistor and an inductor.
(B) a diode, a BJT and an FET.
(C) a capacitor, and an inductor.
(D) an Opamp, a BJT and thermionic triode.

c. In forward mode NPN BJT, if we increase the voltage V_{CC}, the collector current increases

(A) due to ohm's law, higher V_{CC} causes higher current.
(B) due to base width decrease less carrier recombine in the base region.
(C) as the gradient of the minority carriers in the base region becomes steeper.
(D) due to both the reasons **(B)** and **(C)**.

d. The barrier voltage $(V_r \text{ or } V_o)$ in a junction diode is the effect of

(A) the p-side and n-side of the junction forming a battery.
(B) the emf required to move the holes fast enough to have the mobility equal to that of the electrons.
(C) the recombination of charge carriers across the junction leaving behind the opposite charged ions.
(D) the voltage needed to make the semiconductor material behave as a conductor.

e. An emitter follower has high input impedance because

(A) large emitter resistance is used.
(B) large biasing resistance is used.
(C) there is negative feedback in the base emitter circuit.
(D) the emitter-base junction is highly reverse biased.

f. In a differential amplifier an ideal CMRR is

(A) infinity. **(B)** zero.
(C) –1. **(D)** +1.

g. FET is advantageous in comparison with BJT because of

(A) high input impedance. **(B)** high gain-bandwidth product.
(C) its current controlled behaviour. **(D)** high noise immunity.

h. The emission of electrons in a vacuum diode is achieved by

(A) electrostatic field. **(B)** magnetic field.
(C) heating. **(D)** electron bombardment.

PART I
Answer any THREE Questions. Each question carries 14 marks.

Q.2 a. Convert 4A source with its parallel resistance of 15Ω into its equivalent voltage source. **(3)**

b. Determine current flowing through 5Ω resistor in the circuit shown in Fig.1. Use transformation technique. **(4)**

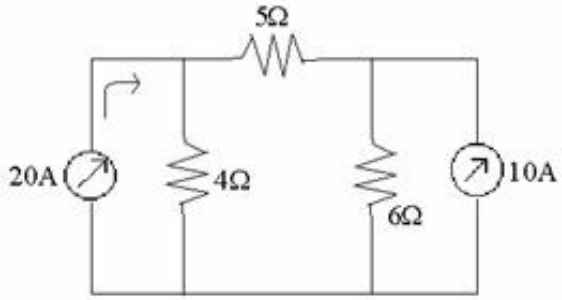


Fig.1

c. Give constructional details of ceramic, mica, film and electrolytic capacitors. Give their typical applications. **(7)**

Q.3 a. Differentiate between an insulator, a semi-conductor and a good conductor. How can we make an intrinsic material to improve conduction necessary for use in BJTs. **(7)**

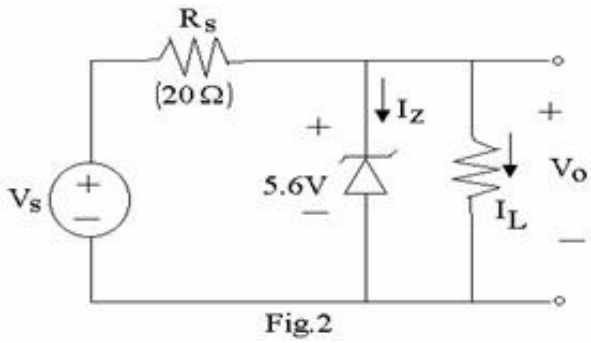
b. For a p n junction diode, draw a typical V-I characteristic. What is meant by
(i) forward resistance

(ii) static resistance
(iii) dynamic resistance of a diode. **(7)**

Q.4 With the help of neat diagram, explain the functioning of a full-wave rectifier. Clearly explain the importance of
(i) PIV
(ii) Ripple factor
(iii) Voltage regulation
(iv) Capacitor filter in the context of a full-wave rectifier with centre tapped transformer. **(14)**

Q.5 a. Explain the Zener phenomenon. How does it differ from Avalanche breakdown? **(7)**

b. Determine the range of unregulated supply for which the load current $0 \le I_L \le 200mA$ remains regulated.



Assume $I_{z\min} = 1mA$

$I_{z\max} = 300mA$

and $V_z = 5.6V$. **(7)**

Q.6 a. Why do we require Voltage Regulators. Explain in detail the working of a DC series Voltage Regulator. Clearly explain the functions of series-pass transistor, current limiter and error amplifier of such a Voltage Regulator. **(10)**

b. With the help of neat diagram explain the working of a Voltage Doubler. **(4)**

PART II
Answer any THREE Questions. Each question carries 14 marks.

Q.7 Explain the functioning of a bipolar junction transistor. What is the

(i) relation between α and β **(3)**
(ii) effect of variation of V_{CC} on the collector current **(4)**

(iii) method of biasing the BJT **(3)**

(iv) selection of proper Q-point for linear operation of a BJT amplifier. **(4)**

Q.8 In the cases of CE and CC configurations of BJT amplifiers, compare :

(i) their input and output impedances. **(3)**

(ii) their Voltage gains and Current gains. **(7)**

(iii) their typical uses-give two uses of each case. **(4)**

Q.9 a. Explain the principle of operation of Field Effect Transistors (FET). How does a JFET and a MOSFET differ in operation? Define the FET parameters g_m, r_d & μ. Show that $\mu = g_m r_d$. **(7)**

b. How can we use FET

(i) as an Amplifier.

(ii) as a Switch. **(7)**

Q.10 a. Describe in detail the construction of a triode. To what use a triode may be put? How does it differ from a BJT? **(7)**

b. Give three uses of a Unijunction Transistor (UJT). Explain one use in detail. **(7)**

Q.11 Write short notes on any **TWO** of the following:

(i) An Operational Amplifier as an adder and as a voltage follower.

(ii) Differential Amplifier, explain CMRR and the uses of a differential amplifier.

(iii) IC Fabrication techniques – for monolithic IC's.

(iv) Realization of an Integrator and a Differentiator using OPAmps. **(2 x 7)**