

Bachelor of Civil Engineering 1st Year, 1st Semester, 2018

## BASIC ELECTRICAL &amp; ELECTRONICS ENGINEERING

## PART - I

Time: Three Hours

Full Marks 100

Question No.	Answer any three of the following (Two marks for neatness and well organised answer script)	Marks
1.a	State and explain Superposition.	4
1.b	Find out the value of current through the $20\Omega$ resistor in the following circuit as shown in figure using Superposition theorem.	12
2.a	State and explain the condition of resonance in a series RLC circuit. Describe the main characteristics of the circuit under this condition with impedance diagram.	3+2
2.b	What do you understand by phase lag and lead? A series R-L-C circuit consist of resistance $R=1\Omega$ , inductance $L=0.1\text{H}$ and capacitance $C=100\mu\text{F}$ . determine the frequency at which resonance will take place. If the applied voltage be 220 V at 50 Hz, determine the current and voltage drops across R, L and C.	3+8
3.a	An iron ring of 30 cm mean circumference has a cross sectional area of $5\text{ cm}^2$ and has a winding of 350 turns on it. Find the current to produce a flux of 0.5 mWb in iron. Relative permeability of iron is 400.	8
3.b	Derive the relationship between alternating voltage and current for a purely capacitive circuit. Also show that the average power consumed by the circuit under alternating excitation is zero. Draw the phasor diagram between voltage and current.	8
4.a	A 10 kW, 250 volt shunt generator having an armature resistance of $0.2\Omega$ and field resistance of $200\Omega$ delivers full load at rated speed of 1000 rpm and at rated voltage of 250 volt. If the machine is operated run as motor at same operating conditions, find the speed of the machine as motor. Neglect brush contact drop.	10
4.b	Discuss the different types of field excitation of DC Machine.	6
5.a	Draw the power triangle and define active power and reactive power by an AC current load.	4
5.b	Can a DC machine work as both dc generator and dc motor? Explain with proper reason?	4
5.c	A 250-volt compound generator has armature, series and shunt field resistances $0.4\Omega$ , $0.2\Omega$ and $150\Omega$ respectively. If this generator supplies 10 kW at rated voltage, find the emf generated in the armature when the machine is connected as long shunt. Ignore armature reaction and allow 1 Volt per brush for contact drop.	8
	Write short note on the following (any four)	4 X 4

- |     |   |
|-----|---|
| 6.a | Maximum power transfer theorem.                 |
| 6.b | Concept of back e.m.f. in a dc motor            |
| 6.c | Speed-Torque characteristics of DC series motor |
| 6.d | Armature reaction in DC machine                 |
| 6.e | Commutation in DC Machine                       |

**Question No1 is compulsory. Answer any four from the rest**

**PART - II**

**Q.1. Indicate the correct answer(s)**

**(1 x 10)**

(i) The Statement valence band overlaps the conduction band is true for

- (a) Silicon (b) Germanium (c) Metal (d) Gallium

(ii) Out of the following which one is most widely use in sold state semiconductor device?

- (a) Uranium (b) radium (c) Calcium (d) silicon

(iii) The capacitance formed at the junction of a reverse biased semiconductor diode is due to

- (a) Unavailability of mobile charges (b) high frequency  
(c) Zener action (d) none of these

(iv) The efficiency of half wave rectifier is

- (a) 48.2% (b) 75% (c) 60% (d) 81.2%

(v) The maximum signal handling capacity of a transistor circuit is found by using

- (a) dc load line (b) ac load line (c) supply voltage (d) signal frequency  
(c) Suppress harmonics in rectified output (d) stabilize dc output voltage

(vi) Compared to common base (CB) amplifier, the common emitter amplifier (CE) has

- (a) Higher current amplification (b) lower leakage current  
(c) Higher output dynamic resistance (d) lower input dynamic resistance

(vii) The number of depletion layer in transistor is

- (a) 1 (b) 2 (c) 3 (d) 4

(viii) The operation of JFET depends on the flow of

- (a) Majority carriers (b) both majority and minority carrier  
(c) Minority carriers (d) recombined carriers

(ix) Feedback amplifier improves

- (a) Input impedance (b) band width (c) stability (d) gain

(x) Valence electrons in silicon atom are

(a) 1 (b) 2 (c) 3 (d) 4

2. (a) In how many ways semiconductor can be classified? What are the differences between them?

(b) Why FET is called unipolar device?

10

(c) Why the input impedance of a MOSFET is higher than that of FET?

(d) Why phase reversal occurs in an amplifier?

3. (a) Carrier concentration in an intrinsic semiconductor material is  $2.5 \times 10^{19}/\text{cm}^3$ . 5+5

Electron mobility is  $0.18 \text{ m}^2/\text{V Sec}$  and hole mobility is  $0.38 \text{ m}^2/\text{V Sec}$ . Calculate the Conductivity of holes.

(b) How the dc load line of semi conductor diode can be drawn? How the operating point changes With the variation of (1) applied voltage (2) load resistance

4. (a) What do you mean by a logic gate? Name the logic gates.

5X2

(b) What do you understand by the term "Universal Gate?" Name them.

(c) What is Half Adder? How many bit it can add?

(d) What do you understand by the term "Radix"?

(e) What is AOI Logic?

5. (a) How does a half wave rectifier differs from the full wave rectifier?

5x2

(b) What factors changes the bias stability of a transistor?

(c) What are the advantages of FET over bipolar transistor?

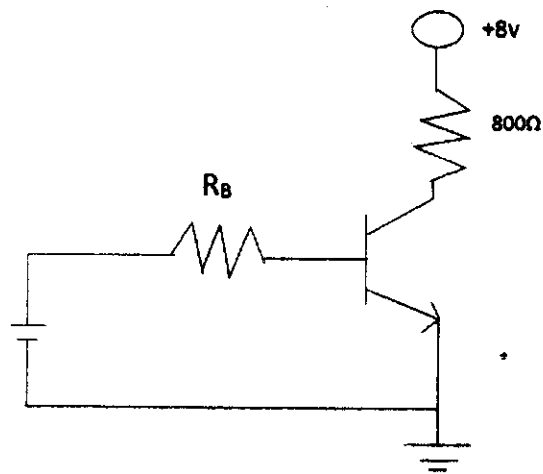
(d) Where common collector circuit is used?

(e) What is the advantage of negative feedback over positive feedback in an amplifier circuit?

6. A transistor is connected in CE configuration in which collector supply voltage  $V$  and voltage drop across  $800\Omega$  collected in the collector circuit is  $0.5V$ . If  $\alpha=0.95$ , determine 5+5

(i) The collector emitter voltage

(ii) Base current



7. (a) What are the application of a FET ?

5x2

(b) How negative feedback can help to reduce the distortion in an amplifier?

(c) How many types of MOSFET are there?

(d) What is self bias? How the self biasing resistor improves the stability of an amplifier circuit?

(e) feedback factor of an amplifier

8. Write short notes for (any three)

10

(a) Zener diode (b) DE MOSFET (c) Positive clamper (d) Phase shift oscillator (e) Stability Factor of a transistor amplifier.