BACHELOR OF POWER ENGINEERING EXAMINATION, 2017

(2nd Year, 1st Semester, Supplementary)

Electronics

Time : Three hours   Full Marks : 100

Instructions : 1. Answer any five questions out of 8 questions.

2. Answers of sub questions of any question should be written in one place. Do not be haphazard.

3. Credit will be given for neat diagrams.

1. a) Define rectification efficiency of a rectifier. Deduce an expression for the same of a half wave rectifier in terms of circuit parameters and find out its' maxm. possible value.   (2+6+2)

   b) A Si-diode ($r_f = 10\Omega$, $V_b = 0.7V$) is operated by an AC source of 50 Hz, Vrms=14.14V in series with a load resistance 500Ω(O/P).Draw the equivalent circuit and calculate peak current and peak O/P voltage. What will be these values if the diode be an ideal one?   (2+2x2+2x2)

2. a) Draw circuit diagrams of (1) a half wave rectifier (2) a full wave rectifier and briefly explain their actions. Also show the natures of O/P voltages if I/P voltage be sinusoidal.

   (1x2+4x2+2x2)

   b) A Si-diode is applied with a forward bias voltage V. Draw rough (I-V) characteristic curves of it, if the diode be (1) a real diode (2) approximate model diode (3) ideal diode.   (2x3)

3. a) Write down the diode equation (Shockley equation) relating current and voltage levels. Explain the symbols used. Also discuss its' approximated forms to explain FB and RB characteristics of a real diode.   (3+2x2)

   b) Deduce that dynamic forward resistance of a diode is inversely proportional to the current at constant temperature.   (7)

   c) Discuss temperature dependence of characteristic curve of a diode.   (6)

4. a) Why common emitter (CE) configuration is more useful than common-base (CB) configuration of a transistor? Draw I/P and O/P characteristic curves of a transistor for both (1) CE configuration and (2) CB-configuration. Also define I/P and O/P resistances of a transistor from these curves for both CE and CB.   (2+2x2+2x2+2x2)

b) Define α and β parameters of a transistors, hence deduce the relation:

$$\frac{I_E}{1} = \frac{I_B}{1-\alpha} = \frac{I_C}{\alpha}$$ Calculate the value of β given that $\alpha = 0.96$.   (5+1)

5. a) Each amplifier of following group- A is <u>closely related</u> with <u>one</u> of the terms of group –B. Find out the matches.

<u>Group-A</u>	<u>Group-B</u>
1) Voltage Amplifier	1)10 Hz to 20 kHz
2) Power Amplifier	2) Large I/P signal
3) Audio frequency Amplifier	3) Good impedance matching
4) Radio frequency Amplifier	4) Small I/P signal
5) R-C coupled Amplifier	5) 300 kHz to 30 MHz
6) Transformer coupled Amplifier	6)Uniform gain-frequency response

    (6x2)

b) Draw circuit diagrams of (1) a R-C coupled amplifier and (2) a transformer coupled amplifier with single battery bias and label its various components
(no descriptions)   (4x2)

6. a) What is Zener breakdown? Draw a voltage regulation circuit using a Zener,a series resistance and a load resistance. Explain its action for variation of load resistance.
    (3+2+5)
b) Draw a neat diagram of a single stage amplifier circuit using a single battery bias and explain the functions of various capacitors present in the circuit.   (5+5)

7. a) Define lower cut-off and upper cut-off frequency of an amplifier. Why are they also called "3dB frequencies"? What is a dB power gain?   (2+2+3+3+2)

b) In an amplifier the maxm. voltage gain is 90dB at 2kHz and gain falls to 87dB at 200Hz and at 3.5 kHz. What is the bandwidth of the amplifier?   (3)

c) Deduce general equation of feed back : $A_{vf} = A_v/(1-kA_v)$ by block diagram. Hence define negative and positive feed back.   (7+2)

8. a) What is the meaning of OPAMP? Discuss the functions of a two I/P ideal OPAMP as : (1) inverting amplifier (2) Non inverting amplifier.   (2+2x4)

b) Draw electronic logic circuits of OR-gate and AND-gate using diodes.   (2x3)

c) Explain the meanings of '+ sign' in the following additions :
1+1=2 ; 1+1=10 ; 1+1=1 ; 1+1=0 with carry 1.   (1x4)