Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (ECE-N)/SEM-3/EC-304/2011-12

2011
ANALOG ELECTRONIC CIRCUITS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

$10 \times 1 = 10$

i) In active region of a BJT the emitter junction is in ..... bias and collector junction is ..... bias.

a) forward, reverse b) forward, forward

c) reverse, forward d) reverse, reverse.

ii) The maximum theoretical efficiency of a class B push-pull transistor amplifier is approximately

a) 25% b) 50%

c) 70.7% d) 78.5%.

iii) The type of power amplifier which exhibits cross-over distortion in its output is

a) class A b) class B

c) class C d) class AB.

iv) An amplifier without feedback has a voltage gain of 50, input resistance of 1 kΩ and output resistance of 2.5 kΩ. The input resistance of the current-shunt negative feedback amplifier using the above amplifier with a feedback factor of 0.2 is

a) $\frac{1}{11}$ kΩ b) $\frac{1}{5}$ kΩ

c) 5 kΩ d) 11 kΩ.

v) In the analysis of a power amplifier, we prefer

a) equivalent circuit analysis

b) graphical method using load line

c) equivalent circuit analysis and graphical method using load line

d) none of these.

vi) An instrumentation amplifier

a) is a differential amplifier

b) has a gain less than 1

c) has very high output impedance

d) has low CMRR.

vii) Which one of the following oscillator is used for the generation of high frequencies ?

a) R-C phase-shift b) Blocking oscillator

c) wien bridge d) L-C oscillator.

viii) Operational amplifiers are used to amplify

a) ac signals only b) dc signals only

c) both ac and dc signals d) none of these.

ix) An ideal regulated power supply should have regulation which

a) maximum b) 50%

c) zero d) 75%.

x) A Class B push-pull amplifier has an ac output of 10 watts. The dc power drum from the power supply under ideal condition is

a) 10 watts b) 12.5 watts

c) 15 watts d) 20 watts.

xi) The output voltage of IC7915 is

a) 15V b) – 15V

c) 5V d) – 5V.

xii) The Schmitt trigger is also known as

a) squiring circuit b) blocking oscillator

c) sweep circuit d) astable multivibrator.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.

$3 \times 5 = 15$

2. With a neat diagram, explain the principle of operation of an antilog amplifier.

3. Explain the operation of transformer coupled class-A power amplifier.

4. Sketch the circuit of Wien-bridge oscillator. Explain the principle of operation & find an expression for the frequency of oscillation.

5. A phase-shift oscillator using a transistor has the following parameter values :

   R_L = 3.3 kΩ; C = 0.01 μF. Calculate the frequency of oscillators & h_{fe} required for operation of an amplifier.

6. What are the differences between Series and Shunt regulator ? Draw a circuit diagram of a shunt regulator and explain its operation. 2 + 3

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. Explain the need for biasing of a transistor. Mention different schemes for biasing a transistor. Compare their merits and demerits. Define stability factors. Explain the self biasing arrangement of the transistor. (3 + 2 + 2) + 3 + 5

8. a) Draw the functional block diagram of 555 timer.

   b) Explain the operation of astable multivibrator using 555 timer. Derive the expressions for frequency in case of the output wareform.

   c) How can you modify the above circuit for 50% duty cycle ? 4 + (5 + 5) + 1

9. a) Derive the maximum efficiency of a class B push-pull amplifier. What is the major drawback of class B operation and how it can be avoided ?

   b) Explain the importance of $P_{C,max}$ in designing the power amplifier.

   c) What is the function of tuned amplifier ?

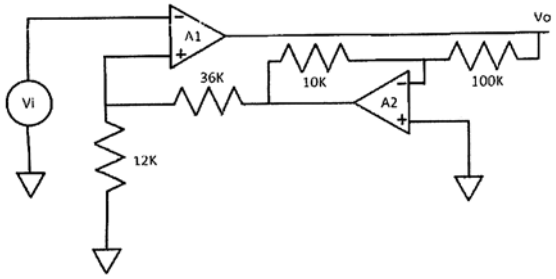
   d) A transformer coupled class A power amplifier has maximum and minimum values of collector-emitter voltage of 25V and 2.5V respectively. Determine its collector efficiency. (4 + 2) + 3 + 3 + 3

10. a) What are the characteristics of an ideal op-amp ?

b) Describe the functions of an op-amp as

i) adder ii) integrator.

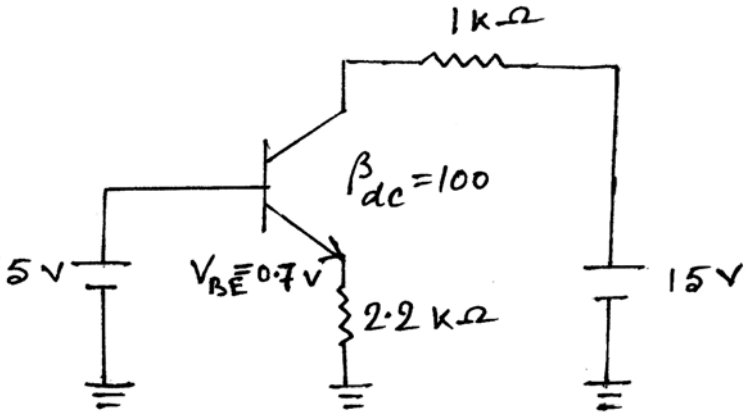
c) Determine the value of the voltage gain $\frac{V_0}{V_i}$ for the following circuit.



d) Explain logarithmic amplifier with circuit diagram.

2 + 4 + 4 + 5

11. a) Explain quiescent point and load line of a transistor amplifier. Find the Q point of the given emitter bias circuit.



b) Define hybrid parameters for a basic transistor circuit in common emitter configuration and give its hybrid model. (5 + 5) + 5

12. Write short notes on any *three* of the following : 3×5

a) Switched Mode Power Supply

b) RC phase shift oscillator.

c) Voltage Controlled Oscillator.

d) PLL

e) Wave shaper

f) Colpitts oscillators.