Benha University
Faculty of Engineering at Shoubra
Electrical Engineering Department
Third Year (Communications)

Final Term Exam (Fall 2015)
Date: Monday (4/1/2016)
Subject: Electronic Circuits (A)
Duration: 4 hours

- **Significant equations sheet is attached.**
- **Answer all the following questions**

- **No. of questions : 5**
- **Total Mark: 90 Marks**

Question (1) (12 Marks)

Choose the correct answer:

1- Which of the h-parameters corresponds to βr_e in a common-emitter configuration?
   a. h_{re} b. h_{fb} c. h_{fe} d. h_{ie}
2- The loaded voltage gain of an amplifier is always less than the no-load level.
   a. True b. False
3- A change in frequency by a factor of _____ is equivalent to 1 decade.
   a. 2 b. 10 c. 5 d. 20
4- By how much does the output signal vary for a class B power amplifier?
   a. 360° b. 180° c. between 180° and 360° d. Less than 180°
5- An oscillator differs from an amplifier because the oscillator
   a. has more gain b. requires no input signal c. requires no dc supply
6- A phase-shift oscillator has
   a. three RC circuits b. three LC circuits c. lead-lag circuit

Question (2) (20 Marks)

1- Differentiate between the audio, tuned and power amplifiers.
2- Sketch the approximate hybrid, hybrid π and r_e models for a common-emitter ***pnp*** transistor. Given r_b= 3Ω, r_π= 1.6kΩ, r_u= 20MΩ, C_u= 1pF, C_π= 5pF, β= 100, h_{oe}= 18 μS.
3- The feedback capacitance of an inverting amplifier is 10 pF. What is the Miller capacitance at the input and the output if the gain of the amplifier is 40dB?
4- Draw two different circuits for phase splitting to be used in class B power amplifier.

Question (3) (25 Marks)

1- For the small-signal amplifier circuit of Fig. 1,
   a. Determine r_e , Z_i.
   b. Derive an equation for A_v and calculate its value.
   c. Determine the lower and higher cut-off frequencies.
   d. Sketch the low-frequency and the high-frequency responses.
   e. Sketch the phase response.
2- For the power amplifier circuit of Fig. 2 and for an input of 10 V rms, calculate
   a. The input power
   b. The output power
   c. The power handled by each output transistor
   d. The circuit efficiency

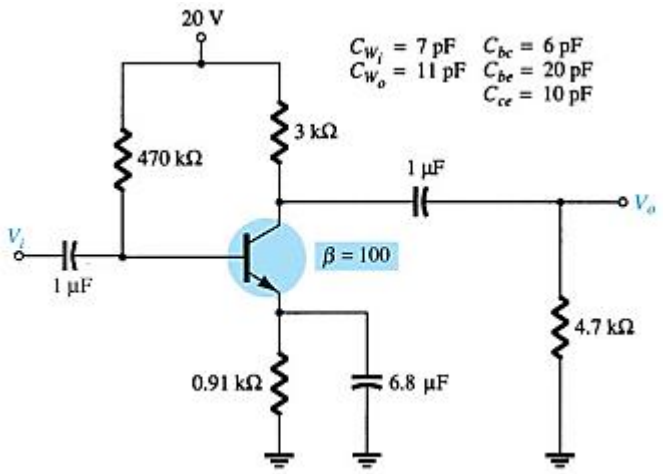


Fig. 1

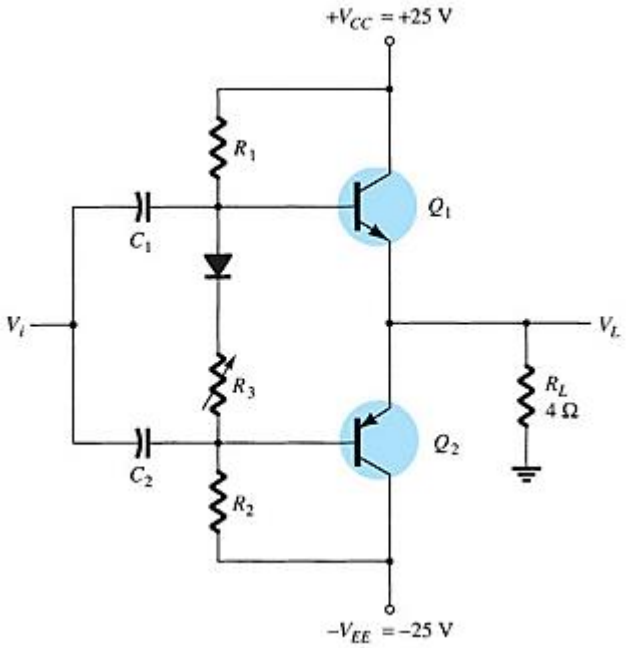


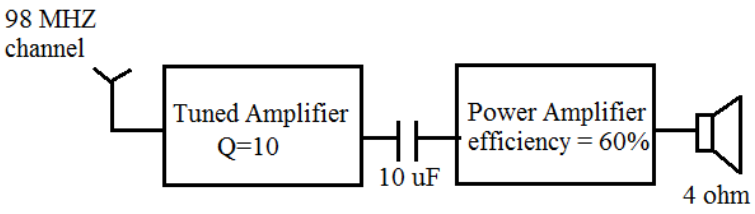
Fig. 2

Question (4) (13 Marks)

1- For the voltage-divider biasing circuit, discuss the condition required to perform the approximate analysis.
2- Derive an equation for the Wien-bridge oscillation frequency and show how you can control its gain automatically.
3- Calculate the resonance frequency of a Hartley oscillator with the elements of the tank circuit as L_1= 1.5 mH, L_2=10 mH and C=470pF.
4- Draw the clamper bias circuit used in tuned amplifier and mention the purpose of its usage.

Question (5) (20 Marks)

1- Design a BJT Audio Amplifier with following specifications:
   - The amplifier consists of two direct coupled stages with total gain of 57 dB.
   - It uses a capacitor to couple a microphone signal with internal resistance of 1kΩ and frequency band between 400 Hz and 3.4 KHz.
   - It drives an 8 Ω speaker through a coupling transformer of 1:3 turns ratio.
   - The speaker signal should be in-phase with the microphone one.
2- Design the following system:



Good Luck,
Dr. Ahmad El-Banna