1. 单选题 (2.0分)

If the PN junction is forward biased, the depletion region would be ____ and the build-in potential is ____.

A.widened, strengthened

B.widened, weakened

C.narrowed, strengthened

D.narrowed, weakened

2. 单选题 (2.0分)

N-type semiconductor is obtained by doping impurity atoms from ____ elements, and its majority carriers are ____.

A.group III, holes

B.group III, free electrons

C.group V, free electrons

D.group V, holes

3. 单选题 (2.0分)

To stabilize the voltage across a load, _____ could be used to construct a voltage regulation circuit.

A.varactor diodes

B.photodiodes

C.light emitting diodes

D.Zener diodes

4. 单选题 (2.0分)

For the NPN BJT transistor, in active region, the BE junction is ____ biased, so the emitter current is constructed mainly due to ____.

A.forward, the diffusion of free electrons

B.forward, the drifting of holes

C.reverse, the diffusion of holes

D.reverse, the drifting of free electrons

5. 单选题 (2.0分)

Which of the following statement is TRUE _____.

A.To amplify a small signal, BJT and FET must work in their active region.

B.To amplify a small signal, BJT and FET must work in their saturation region.

C.To amplify a small signal, BJTs should be worked in active region while FETs would be work in saturation region.

D.To amplify a small signal, BJTs and FETs must switch between cut off region and saturation region.

6. 单选题 (2.0分)

For n-channel MOSFET amplifier, voltage _____ is mainly used to control the width of channel.

A. U_{GS}

B. U_{GD}

C. U_{SD}

D. U_G

7. 单选题 (2.0分)

For BJTs amplifier circuit, the collector current is affected mainly by _____.

A.base current i_b

B.voltage u_{ce}

C.collector resistance R_C

D.load resistance R_L

8. 单选题 (2.0分)

For BJTs and FETs, which of the following statement is FALSE _____.

A.FETs and BJTs could both be used as amplifiers.

B.Biasing circuit is used for BJT amplifiers to provide proper DC operation points.

C.FETs are voltage-controlled devices wile BJTs are current-controlled ones.

D.BJTs has higher input impedance and gains compared with FETs.

9. 单选题 (2.0分)

For the construction of the BJTs, which of the following is TRUE _____.

A.The emitter region is the lowest doped.

B.The base layer is very narrow.

C.The collector region is the highest doped.

D.The based region is highest doped.

10. 单选题 (2.0分)

For a BJT amplifier, its high-frequency response is affected by _____, while low-frequency response is affected by _____.

A.parasitic capacitances, coupling and bypass capacitors

B.coupling and bypass capacitors, parasitic capacitances

C.bypass capacitors, coupling capacitors

D.coupling and bypass capacitors, wiring capacitance

11. 单选题 (2.0分)

For the FETs, which of the following statement is FALSE _____.

A.To get a proper operation point for n-channel JFET amplifiers, the DC biasing voltage across gate and source must be negative.

B.Depletion MOSFETs could work properly as an amplifier whatever the channel could be narrowed or widened.

C.For n-channel Enhancement MOSFETs, a proper channel must be constructed by biasing the DC voltage across gate and source to be positive.

D.To get a proper operation point for p-channel JFET amplifiers, the DC biasing voltage across gate and source must be negative.

12. 单选题 (2.0分)

If the high cut-off frequency and low cut-off frequency is expressed by f_H and f_L respectively, then the bandwidth of the circuit is _____.

A.f_H

B.f_L

C.f_L-f_H

D.f_H-f_L

13. 单选题 (2.0分)

To amplifier both voltage and current of a small input voltage signal, _____ amplifier could be used.

- A.CE.
- B.Emitter follower.
- C.CB.
- D.CC.

14. 单选题 (2.0分)

For the circuit with ideal diodes in **Figure 1** (b), with an input sinusoidal signal in **Figure 1** (a), what is the function of the circuit: _____.

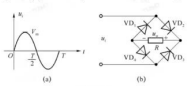


Figure 1

- A.half-wave rectifier
- B.full-wave rectifier
- C.regulator
- D.amplifier

15. 单选题 (2.0分)

For a voltage-series negative feedback amplifier, compared with its open amplifier, the input resistance is _____ and the output resistance is _____.

- A.increased, decreased
- B.increased, increased
- C.decreased, increased
- D.decreased, decreased

16. 单选题 (2.0分)

To ensure an op-amp work in linear application region, the external circuit around it must be constructed as _____.

- A.possive feedback.
- B.negative feedback.
- C.open circuit.
- D.none of the above.

17. 单选题 (2.0分)

For op-amps, which of the following statement is FALSE ____.

- A.The input impedance and gain is ralativly high.
- B.the bandwidth is very small.
- C.It can work in linear region as an amplifier.
- D.It can work in nonliear region as a comparator.

18. 单选题 (2.0分)

Two identical amplifiers with each unloaded gain as A_{uNL} and bandwidth as H_{BW} are cascaded, which of the following is TURE _____.

- A.The overall gain is A_{uNL}^2.
- B.The overall gain is less than A_{uNL}^2.
- C.The overall bandwidth is $2H_{BW}$.
- D.The overall bandwidth is H_{BW}.

19. 单选题 (2.0分)

For power amplifier, the operation point of the BJT could be in ___, while to get a higher power efficiency the operation point would be in____.

- A.active region, active region
- B.cut-off region, active region
- C.saturateration region, cut-off region
- D.active region, cut-off region

20. 单选题 (2.0分)

For the comparator circuit, which of the following statement is FALSE _____.

- A.It's output is discrite signal.
- B.It work in nonlinear application region
- C.It's output is linear amplification of the input.
- D.It is connected as open circuit.

21. 单选题 (2.0分)

The bandwidth of CE amplifier is relative narrow due to _____. Therefore, to enlarge CE amplifier bandwidth, a ____ could be used as the load of CE.

- A.Miller effect, CB
- B.Miller effect, CE
- C.Early effect, CB
- D.Early effect, CE

22. 单选题 (2.0分)

Practically, the resistance of a signal source will ___ the voltage gain of an amplifier.

- A.reduce
- B.increase
- C.has no effect on
- D.either reduce or increase

23. 单选题 (2.0分)

Current mirror would be used as _____.

- A.constant current source and active load
- B.constant voltage sources and active load
- C.current amplifier and constant current source
- D.current amplifier and active load

24. 单选题 (2.0分)

Op amps could be used to construct _____ circuits.

- A.sum and subtractor
- B.subtractor and integrator
- C.active filter
- D.all of the above

25. 单选题 (2.0分)

____ circuit is commonly used in integrated circuits.

- A.Differential pair
- B.Current mirror
- C.Complementary symmetric push-pull amplifier
- D.All of above

26. 简答题 (12.0分)

For the CE amplifier circuit in **Figure 2**, For the transistor in the circuit, β=60, VBE(on)=0.7V, $r_{ce}=\infty$, VT=26mV (at room temperature). Answer the questions below:

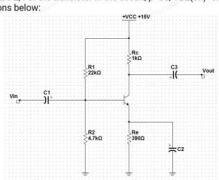


Figure 2

a) What is the configuration of the BJTs (choose among CE, CB, and CC)? What is the type of the biasing circuit (choose among fixed bias, emitter bias and voltage divider bias) and its advantage? **(3 marks)**

b) Calculate the operation point as I_{EQ}, U_{CEQ}, and ac equivalent model parameter r_e. **(3 marks)**

c) Calculate the voltage gain A_u, the input impedance Z_i, and the output impedance Z_o. **(6 marks)**

For the negative feedback circuits shown in **Figure 3**, answer the questions below:

a) Determine the type of each negative feedback circuits from (a) to (d). **(8 marks)**

b) For circuit in **Figure 3** (a), if the AC negative feedback is strong enough, calculate the voltage gain A_{uf}, the input impedance R_{if} and output impedance R_{of} by approximate analysis method. **(6 marks)**

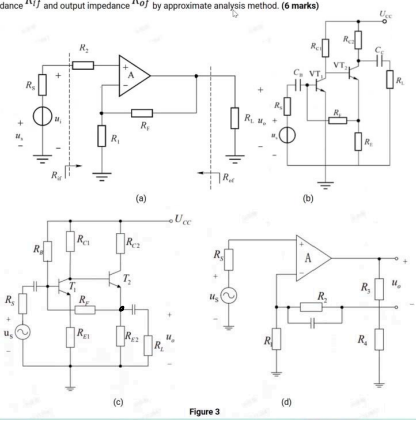
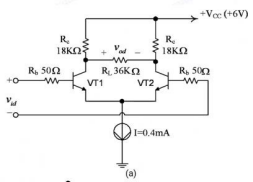


Figure 3

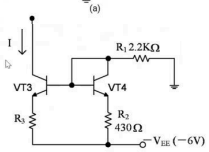
28. 简答题 (7.0分)

For the differential amplifier circuit in **Figure 4** (a), VT1 and VT2 are perfectly matched. For all the transistors in the circuit, β=60,VBE =0.6V, VT=26mV (at room tempurature).
a) Calculate ICQ1 and ICQ2 and parameter r_e of the BJT AC equivalent model. **(2 marks)**

b) Find the voltage gain of differential-mode signal $A_d = \frac{v_{od}}{v_{id}}$, the input resistance Rid and output resistance Rod. **(3 marks)**
c) If the dc current source is realized by the current mirror circuit shown in **Figure 4** (b), determine the value of R3. **(2 marks)**



(a)



(b)

Figure 4

29. 简答题 (7.0分)

For the class B complementary symmetric power amplifier circuit shown in **Figure 5**, the base currents of Q1 and Q2 are negligible, and the saturation voltages of Q1 and Q2 are negligible. Consider a sinusoidal input signal with amplitude voltage of 17V.
a) Calculate the input power from DC sources, the output power, the power efficiency. **(6 marks)**
b) What is the role of the diode and R_3? **(1 marks)**

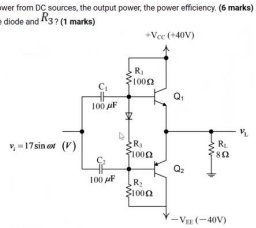


Figure 5

30. 简答题 (10.0分)

In the circuit of **Figure 6**, the op-amp are ideal. Zener Diode with VZ=±10V, R1=100KΩ, R2=2KΩ, R=10KΩ, C=1μF; vi1= 5V, vi2=5.1V, VR=-5V; Power supply Vcc=±15V; at t=0, vo2(0)=0V.

a) Give out the equations of v_{o1}, v_{o2}, v_{o3}, v_{o4}, v_o. **(5 marks)**

b) If connected to power supply at t=0, determine the output voltage v_{o1}, v_{o2}, v_{o3}, v_{o4}, v_o of each op-amp at t=5.1s? **(5 marks)**

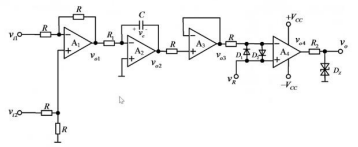


Figure 6