# Electronics, Digital and Microprocessor Technology

**Exam Test Questions**

**Part 1 – Electronics**

1. Draw the VA characteristic of *PN* junction diode (in forward and reverse direction) for two temperatures ($T_2 > T_1$) in common coordinate system. Define the temperature coefficient of forward voltage $TKU_F$.

2. What is the voltmeter voltage in the circuit if a diode is from Si? Calculate the current through the circuit.
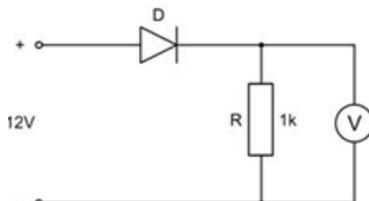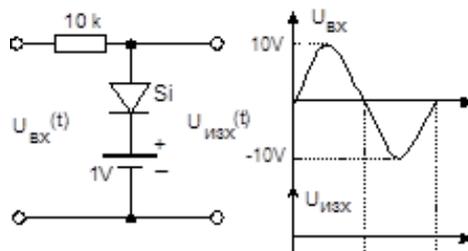


3. What is the voltmeter voltage in the circuit if a diode is from Si? Calculate the current through the circuit.
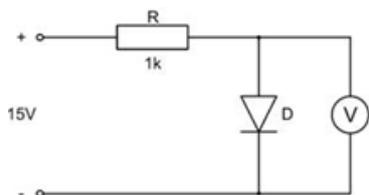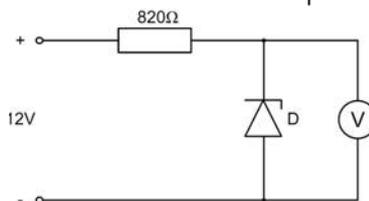


4. Draw the ac output voltage waveforms for the circuit in figure.
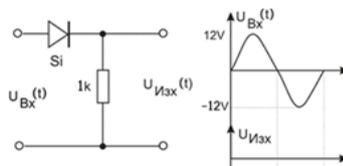


5. Draw the ac output voltage waveforms for the circuit in figure.



6. What is the voltmeter voltage in the circuit if the Zener diode has a Zener voltage $U_Z = 9V$? Calculate the current through the circuit.



7. Draw a circuit of a voltage regulator.
8. Draw a circuit with common-base (CB) connection of an *NPN* bipolar transistor in active mode. Show the polarities of the voltages at transistor terminals and the direction of currents in the circuit.
9. Draw the output VA characteristic of bipolar transistor in common emitter connection $I_C = f(U_{CE})/I_B = const$.
10. Draw a circuit of a forward biased LED. Calculate the current limiting resistor (just formula).
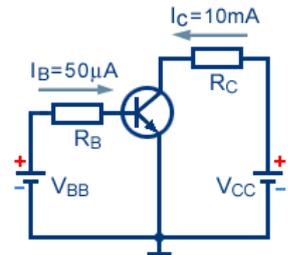
11. What is a transistor connection (CB or CE) in figure? Calculate the collector current $I_C$ of the bipolar transistor in figure? What is the value of emitter current $I_E$?
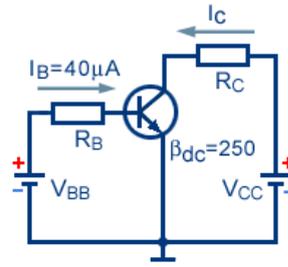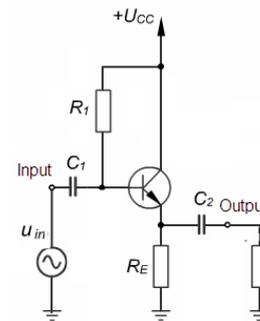


12. What is a transistor connection (CB, CE or CC) in figure?
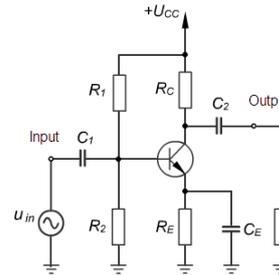


13. What is a transistor connection (CB or CE) in figure? Calculate the current gain $\beta$ of the bipolar transistor in figure? What is the value of emitter current $I_E$?



14. What is a transistor connection (CB, CE or CC) in figure?



15. Draw the output VA characteristics of an *N*-channel enhancement-mode MOSFET – $I_D = f(U_{DS})/U_{GS}$=const. Show the value and polarity of the gate voltage in any curve, so that transistor is conducting.

**Part 2 – Digital Technology**

1. Write the binary equivalent of decimal number 35.
2. Write the decimal representation of binary number 000101110000.
3. Write the correct SOP forms for the logic expression Y = A(B+CD).
4. Draw the circuit for Boolean expression Y = ABC+ DE.
5. Draw the circuit for Boolean expression Y = (A+B)(B+C)D
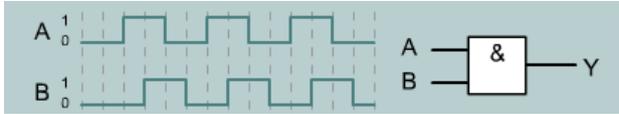
6. Fill in the truth table of the logic gate



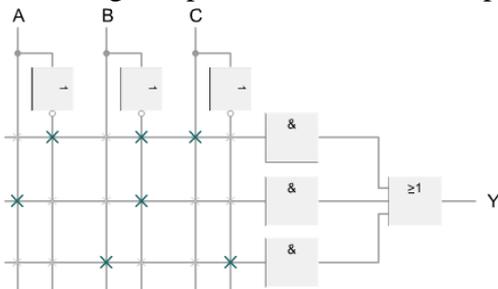| $X_2$ | $X_1$ | Y |
|-------|-------|---|
| 0 | 0 | |
| 0 | 1 | |
| 1 | 0 | |
| 1 | 1 | |

7. Fill in the truth table of the logic gate



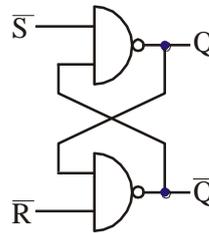| $X_2$ | $X_1$ | Y |
|---|---|---|
| 0 | 0 | |
| 0 | 1 | |
| 1 | 0 | |
| 1 | 1 | |
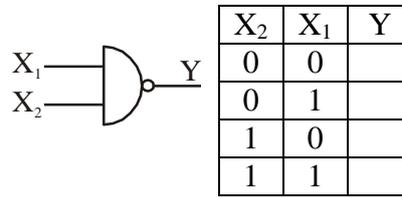
8. Draw the wafeforms in the output Y if the input waveforms applied to a logic element are as shown in the diagram.



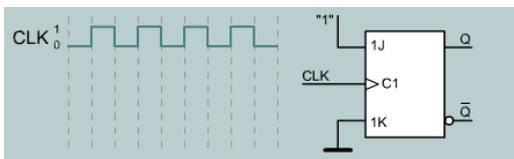9. Write a logic expression of a circuit implemented in PAL.



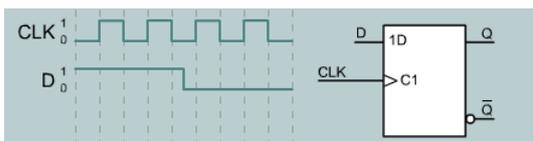10. Fill in the truth table of S-R latch with NANDs



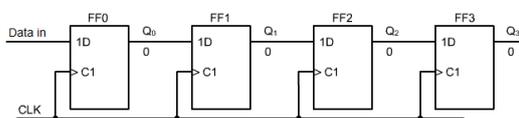| $\overline{S}$ | $\overline{R}$ | $Q$ | $\overline{Q}_n$ |
|---|---|---|---|
| 0 | 0 | | |
| 0 | 1 | | |
| 1 | 0 | | |
| 1 | 1 | | |

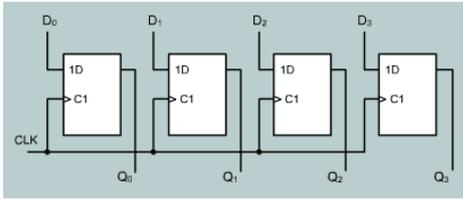11. Draw the Q-output waveform assuming that Q starts Low.



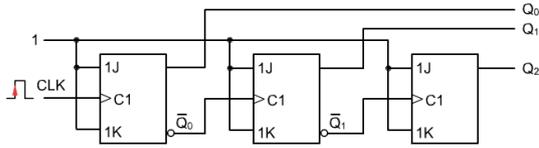12. Draw the Q-output waveform assuming that Q starts Low.
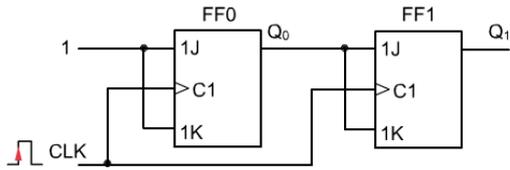


13. What is a type of the circuit in figure?



14. What is a type of the circuit in figure?

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15. What is a type of the circuit in figure?



16. What is a type of the circuit in figure?



**Part 3 – Microprocessor Technology**