ELEKTRONIKAI ALAPISMERETEK ANGOL NYELVEN

KÖZÉPSZINTŰ ÍRÁSBELI VIZSGA

2010. május 14. 8:00

Az írásbeli vizsga időtartama: 180 perc

Pótlapok száma

Tisztázati

Piszkozati

OKTATÁSI ÉS KULTURÁLIS MINISZTÉRIUM

ÉRETTSÉGI VIZSGA • 2010. május 14.
Important information

You may use a non-programmable calculator as the only auxiliary tool for solving the written test. Use blue ink pen when writing and black lead pencil when drawing. When solving simple short assignments, use the spaces left available below them in the test sheets. When solving complex assignments, use the supplementary sheets received from supervisor teachers, by specifying your name and class on them. Attach a page number to each supplementary sheet.

When solving assignments involving calculations, take care to write down relationships (formulas) correctly, carry out substitutions properly, and make calculations accurately. Points will be deducted when any of these aspects are lacking. You may not be awarded with maximum points for an end result unless both its value and measurement unit are fully correct.

When solving assignments, take care to produce a neat and well-organised written test, to apply standard symbols, and to comply with requirements in terms of engineering, format and aesthetics. Points will be deducted when any of these aspects are lacking. You are requested to cross any incorrect parts in your solution by a diagonal line.

You may prepare a fair copy of your solution within the time frame available for solving the test. In such case, you will prepare a “Draft copy” and a “Fair copy” with continuous page numbers attached to them.
Simple short assignments  Maximum points: 40

1.) Determine the DC resistance of a wire with a specific resistance of $\rho = 0.0175 \ \Omega \cdot \text{mm}^2/\text{m}$, a length of $l = 100 \ \text{m}$, and a cross section of $A = 0.75 \ \text{mm}^2$.  

$$\text{3 points}$$

$$R =$$

2.) Determine the resultant resistance of three resistors connected in parallel.  

Data: $R_1 = 100 \ \Omega$, $R_2 = 150 \ \Omega$, $R_3 = 300 \ \Omega$.  

$$\text{3 points}$$

$$R =$$

3.) Determine the value of the series resistor necessary for an instrument with a measurement limit of $U_0 = 200 \ \text{mV}$ in order to ensure that the new measurement limit is $U = 7.5 \ \text{V}$. The instrument takes up a current of $I_0 = 100 \ \mu\text{A}$ at a voltage of $U_0 = 200 \ \text{mV}$.  

$$\text{3 points}$$

$$R_s =$$

4.) Complete the table below. The table must express the frequency dependence of inductive reactance.  

$$\text{4 points}$$

<table>
<thead>
<tr>
<th>f (kHz)</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>2.5</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X_L$ (Ω)</td>
<td></td>
<td>200</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.) Determine the impedance of a serial R-C circuit.  

Data: $R = 10 \ \text{kΩ}$, $X_C = 7.5 \ \text{kΩ}$.  

$$\text{4 points}$$

$$Z =$$

6.) Determine the effective power of a single-phase AC consumer.  

Data: $U = 230 \ \text{V}$, $I = 8 \ \text{A}$, $\cos \varphi = 0.85$.  

$$\text{3 points}$$

$$P =$$
7.) Determine the exact value of the emitter current of a bipolar transistor with a DC current amplification factor of $B = 20$ and a base current of $I_B = 400 \, \mu\text{A}$.  

$$I_E =$$

8.) Determine the power amplification of an amplifier.  

Data: $u_{in} = 100 \, \text{mV}$, $i_{in} = 10 \, \mu\text{A}$, $u_{out} = 1 \, \text{V}$, $i_{out} = 500 \, \text{mA}$.  

$$A_p =$$

9.) Draw the basic circuit of an inverting amplifier by using one operational amplifier and three resistors.  

10.) Calculate the input voltage of an amplifier with an input resistance of $R_{in} = 100 \, \text{k}\Omega$, if the idle terminal voltage of the control signal source is $U_g = 60 \, \text{mV}$, and its internal resistance is $R_g = 20 \, \text{k}\Omega$.  

$$U_i =$$

11.) Write down and simplify the function realised by the logic network below.  

$$D \quad 1 \quad 1 \quad 1 \quad F^2 \quad F^2 =$$

12.) Write down the regular (canonical) algebraic form of the logic function below. Use ‘A’ to denote the variable of the highest place value. You are not required to simplify the function.  

$$F^3 = \Pi^3(2, 4, 6)$$

$$F^3 =$$
Complex assignments

Assignment 1

Calculate a voltage divider

Data:
- $U_{in} = 6 \text{ V}$
- $R_1 = 20 \text{ k}\Omega$
- $P = 30 \text{ k}\Omega$
- $R_2 = 10 \text{ k}\Omega$

Assignments:

a) Determine the minimum and maximum values of the output voltage ($U_{out_{min}}$ and $U_{out_{max}}$) to be set in case of unloaded output ($R_l = \infty$).

b) Determine the minimum and maximum values of the output voltage ($U_{out_{min}}$ and $U_{out_{max}}$) to be set in case $R_l = 40 \text{ k}\Omega$.

Assignment 2

Calculate an R-C network

Data:
- $C = 10 \text{ nF}$
- $R = 15 \text{ k}\Omega$
- $U = 2 \text{ V}$
- $f = 1 \text{ kHz}$
- $U$, $I$, $I_C$ and $I_R$ have effective values

Assignments:

a) Determine the values of the currents ($I_C$, $I_R$, $I$).

b) Calculate the impedance of the circuit ($Z$).

c) Determine the absolute value of the phase angle ($\varphi$) between the input voltage ($U$) and input current ($I$).
Assignment 3

Maximum points: 15

Determine the features of an amplifier on the basis of measurements

![Amplifier Diagram]

Data:
- \( u_1 = 20 \text{ mV} \)  
  \( u_{3u} = 900 \text{ mV} \) (output voltage of unloaded amplifier)
- \( u_2 = 15 \text{ mV} \)  
  \( u_{3l} = 750 \text{ mV} \) (output voltage of loaded amplifier)
- \( R_S = 2.5 \text{ k\Omega} \)
- \( R_l = 1.5 \text{ k\Omega} \)

Assignments:

a) Determine the input resistance of the amplifier (\( R_{in} \)).

b) Determine the output resistance of the amplifier (\( R_{out} \)).

c) Calculate the voltage amplification of the amplifier when unloaded/loaded (\( A_{uu}, A_{ul} \)).

d) Calculate the current- and power amplification of the amplifier when loaded (\( A_i, A_p \)).

Assignment 4

Maximum points: 15

Design a combinational network

The Veitch-table of a logic function is specified as follows:

<p>| | | | |</p>
<table>
<thead>
<tr>
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<td>1</td>
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<tr>
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<td>12</td>
<td>13</td>
<td>1</td>
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<tr>
<td>D</td>
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<td></td>
<td>8</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>10</td>
<td>1</td>
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</tbody>
</table>

Assignments:

a) Write down the serial number form of the function.

b) Simplify the function by using the graphical method.

c) Realise the function by using NOT, AND and OR gates.
   (The variables are available in positive form only.)

d) Realise the function by using NAND gates.
   (The variables are available in positive form only.)
## Elektronikai alapismeretek angol nyelven középszint

### Topics

<table>
<thead>
<tr>
<th>Serial numbers of assignments</th>
<th>Maximum points</th>
<th>Awarded points</th>
<th>Maximum points for the topic</th>
<th>Awarded points for the topic</th>
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<tr>
<td>12.</td>
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<td><strong>Total points for the written part of the examination</strong></td>
<td><strong>100</strong></td>
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**Simple short assignments**

**Complex assignments**

**Total points for the written part of the examination 100**

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**Corrected by teacher**

Date: .................................

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**Pontszáma egész számra kerekítve/ Score rounded to integer number**

**Programba beírt egész pontszám/ Integer score input in SW application**

**Egyszerű, rövid feladatok/ Simple short assignments**

**Összetett feladatok/ Complex assignments**

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**Javító tanár / Corrected by teacher**

**Jegyző / Notary**

**Dátum / Date:** .................................

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