PAST EXAM PAPER & MEMO N3

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Scientific calculators may be used.

This question paper consists of 5 pages.
INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Subsections of questions may NOT be separated.
5. Sketches must be neat.
6. Write neatly and legibly.
QUESTION 1

1.1 Name the primary colours that must be mixed to give the following colours in the additive colour-mixing process, and indicate the voltage value for each colour.

1.1.1 Magenta
1.1.2 Cyan
1.1.3 Yellow

1.2 Give the voltage value of the black colour.

(3 x 3) (9) (1) [10]

QUESTION 2

Explain fully the terms below as used in television. Where possible make use of sketches to enhance the answer.

2.1 Bandwidth
2.2 In-line tube
2.3 Shadow mask

(3 x 4) [12]

QUESTION 3

Make a neat, labelled sketch of a LOG periodic antenna and name the advantages of this type of antenna.

[9]

QUESTION 4

4.1 Explain the following CRT construction stages:

4.1.1 The heater
4.1.2 The cathode
4.1.3 The control grid
4.1.4 The first anode
4.1.5 The second anode
4.1.6 The third anode

(6 x 2) [12]
QUESTION 5
Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–G) next to the question number (5.1–5.6) in the ANSWER BOOK.

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1 Wire mesh</td>
<td>A flat transparent optical window made of glass</td>
</tr>
<tr>
<td>5.2 Aspect ratio</td>
<td>B the current flowing from the target ring</td>
</tr>
<tr>
<td>5.3 Secondary electrons</td>
<td>C target is just behind the light-sensitive tube face</td>
</tr>
<tr>
<td>5.4 Photocathode</td>
<td>D picture width to picture height in a camera and television</td>
</tr>
<tr>
<td>5.5 Signal current</td>
<td>E electrons emitted from the surface of the photocathode</td>
</tr>
<tr>
<td>5.6 Signal plate</td>
<td>F the light-sensitive face plate of the camera</td>
</tr>
<tr>
<td></td>
<td>G direct current</td>
</tr>
</tbody>
</table>

QUESTION 6
Explain, in terms of operational circuits, FIVE ways in which a colour TV differs from monochrome.

QUESTION 7
Draw a fully labelled circuit diagram of a typical tripler circuit for the generation of EHT.

QUESTION 8
Name THREE band channel frequencies used for selection purposes in the colour receivers.

QUESTION 9
Fully describe the following terms relating to chrominance circuits:

9.1 PAL decoder
9.2 Colour burst.
QUESTION 10

Choose the correct word(s) from those given in brackets. Write only the word(s) next to the question number (10.1–10.5) in the ANSWER BOOK.

10.1 The (additive/subtractive) colour-mixing process is used in photography.

10.2 Materials whose resistance change when light falls on them are known as (photo emissive/photo conductive).

10.3 The tuners used in a monochrome and in a colour television receiver are (the same/not the same).

10.4 The television tube makes use of (line-by-line/interlaced) scanning.

10.5 The horizontal scanning frequency is (50 Hz/15625/17625).

(5 × 1) [5]

QUESTION 11

Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true or 'false' next to the question number (11.1–11.5) in the ANSWER BOOK.

11.1 Monochrome and colour television receivers use the same luminance amplifiers.

11.2 The notch filter is used in a monochrome television receiver.

11.3 Dark current refers to a current that flows if light falls on a television camera tube lens.

11.4 Flash-overs are caused by high EHT.

11.5 Heterodyning is the process of beating two frequencies together to produce sum and difference frequencies.

(5 × 1) [5]

QUESTION 12

Make a labelled sketch of a simple resistive matrix circuit to form a G-Y signal. [5]

TOTAL: 100
MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

RADIO AND TELEVISION THEORY N3

5 APRIL 2016

This marking guideline consists of 7 pages.
QUESTION 1

1.1 1.1.1 Magenta = red + blue = 0.41 V
1.1.2 Cyan = blue + green = 0.7 V
1.1.3 Yellow = red + green = 0.89 V

1.2 0 volts

QUESTION 2

2.1 The frequency range between two half-power points at 0.707 max (-3db) of current and/or voltage.
2.2 The electron guns are arranged in a horizontal format, the phosphor material is deposited in stripes.

2.3 Shadow mask cathodes are arranged in the triangular format.
QUESTION 3

Advantages

- It is a wide bandwidth
- Medium gain
- Strong construction
- Directional
- Eliminates ghosting

QUESTION 4

4.1 Explain the following CRT construction stages:

4.1.1 The heater is made from a high resistance tungsten material operating at 6.3 volts and drawing approximately 300 mA. The heater heats up the cathode.

4.1.2 The cathode when heated up it emits free electronic beam.

4.1.3 The control grid controls the electron beam intensity by means of controlling the voltage between the grid and cathode.

4.1.4 The first anode accelerates electron beam by means of the positive voltage of 200 and 500 volts to the second anode.

4.1.5 The second anode accelerates electron beam by means of the positive voltage of 4000 and 5000 volts to the second anode. This voltage forms an electrostatic field or focus lens with the first anode.
4.1.6 The third anode operates around 25 000 volts to accelerate the narrow beam up to 125 000 km/h to produce high electron energy so as to excite the screen phosphors.

QUESTION 5

5.1 C  
5.2 D  
5.3 E  
5.4 F  
5.5 B  
5.6 A

(6 x 2) [12]

QUESTION 6

A colour TV receiver has the following:

- Controls by which the viewer can adjust the colour in the picture
- Correction equipment, needed to give the best possible picture and sound with the least interference between all the complex signals present in the TV
- Colour program identifying circuits, to adjust from monochrome to colour, and black
- PAL circuits to cancel out phase shift errors in the transmitted signal (chrome decoder)
- Colour processing circuits, to recover the three colours from the broadcast signal (Any applicable answer allowed)

(6 x 1) [6]

QUESTION 7

(Any applicable answer allowed) [10]
QUESTION 8

- BAND 3 covers 174 to 230 MHz
- BAND 4 covers 470 to 598 MHz
- BAND 5 covers 598 to 860 MHz

QUESTION 9

9.1 **Pal decoder**
A 1 volt composite video signal is applied to the chrominance and burst amplifiers. The chrominance amplifier extracts the chrominance 4.4 MHz signal and amplifies it. The burst gate identifies the colour burst as a PAL colour burst signal and allows the chrominance signal through. The burst phase corrects the 4.43 MHz built-in reference oscillator. The PAL switch is activated by the line pulses and switches the phase of the R-Y demodulator through 180 degrees on the alternative lines in sync with the PAL signal. The reference oscillator signal he de-modulates the R-Y and B-Y chrominance signal in the V and U demodulators by comparing the phase of the reference oscillators with the chrominance signal. The difference is the R-Y and B-Y outputs.

9.2 **Colour burst** is a 10 cycle of 4.43 MHz on the back porch of the synchronising pulse of every line carrying colour information. Its duration is 2.2 µsec. The purpose of the burst is to keep the reference oscillator of 4.43 MHz in the chrominance decoder, phase locked. It is also used to identify the presence or absence of a PAL colour signal.

(5 x 2)

QUESTION 10

10.1 Subtractive
10.2 Photoconductive
10.3 The same
10.4 Interlaced
10.5 15625 Hz

(5 x 1)

QUESTION 11

11.1 False
11.2 False
11.3 False
11.4 False
11.5 True

(5 x 1)
QUESTION 12
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