ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2012
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALIZATION PAPER for ELECTRONICS & COMMUNICATIONS ENGINEERING

Date	: 14 October 2012
Total Marks	: 100
Examination Time	: 150 minutes (2.5 hours)
Reading Time	: 15 Minutes (prior to examination time)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY:

1. Write your Roll Number clearly on the Answer Booklet in the space provided.
2. The first 15 minutes is being provided to check the number of pages, printing errors, clarify doubts and to read the instructions. You are NOT PERMITTED TO WRITE during this time.
3. Use either Blue or Black ink pen or ball point pen for the written part and Pencils for the sketches and drawings.
4. All answers should be written on the Answer Booklet provided. Candidates are not allowed to write anything on the question paper or any other materials.
5. All answers must be labeled with appropriate question numbers (Section, Question and sub-Question Numbers wherever applicable). Unlabelled answers will not be assessed.
6. This Paper is divided into two sections-namely SECTION A and SECTION B.
7. SECTION A consists of two parts: Part I and Part II.

   Part I consists of 30 Multiple-Choice Questions carrying one (1) mark each and is compulsory. The answer of your choice should be clearly written in whole along with the question and option number on your answer booklet. Eg. 31(c).

   Part II consists of four (4) short answer questions of five (5) marks each and all questions are compulsory.

8. SECTION B consists of two Case Studies. Choose only ONE case study and answer the questions under your choice. Each case study carries fifty (50) marks in total.
9. This Paper consists of NINE (9) pages including this Instruction page.

SECTION A

Part I (30 Marks)

Multiple Choice Questions (All questions to be answered)

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1. If 60 J of energy are available for every 15 C of charge, what is the voltage?

A. 4 V
B. 60 V
C. 15 V
D. 0.25 V

2. An atom's atomic number is determined by the number of:

A. Neutrons minus protons
B. Protons
C. Electrons
D. Neutrons

3. A voltage will influence current only if the circuit is:

A. Open
B. Insulated
C. High resistance
D. Closed

4. Which resistive component is designed to be temperature sensitive?

A. Thermistor
B. Rheostat
C. Potentiometer
D. Photoconductive cell

5. Primary batteries, unlike secondary batteries, may be:

A. Charged once
B. Used once
C. Recharged over and over
D. Stored indefinitely

6. With Ohm's law, if voltage increases and resistance stays the same :

A. Current remains the same
B. Power decreases
C. Current increases
D. Resistance decreases

7. With 1 mA of current, what wattage rating should a 470 ohm resistor have?

A. 1/4 watt
B. 1/2 watt
C. 1 watt
D. 2 watts

8. When does ***maximum power transfer*** happen from the source to the load?

A. When the source resistance is greater than the load resistance
B. When the source resistance is less than the load resistance
C. When there is negligible source resistance
D. When the source resistance equals the load resistance

9. A transformer is plugged into a 120 V rms source and has a primary current of 300 mA rms. The secondary is providing 18 V across a 10 Ωload. What is the efficiency of the transformer?

A. 88%
B. 90%
C. 92 %
D. 95%

10. The coefficient of coupling between two coils is 0.45. The first coil has an inductance of 75 mH and the second coil has an inductance of 105 mH. What is the mutual inductance between the coils?

A 3.54 mH
B. 7.88 mH
C. 39.9 mH
D. 189.3 mH

11. Increasing the number of turns of wire on the secondary of a transformer will

A. Increase the secondary current
B. Decrease the secondary current
C. Have no effect on the secondary current
D. Increase the primary current

12. What is the turn ratio of the transformer needed to match a 1 kΩ source resistance to a 160 Ω load?

A. 2.5:1
B. 0.4:1
C. 6.25:1
D.16:1

13. Internally, a computer's binary data are almost always transmitted on parallel channels, commonly referred to as the:

A. Parallel bus
B. Serial bus
C. Data bus
D. Memory bus

14. Which bus is bidirectional?

A. Data bus
B. Control bus
C. Address bus
D.Multiplexed bus

15. Which type of programming is typically used for digital signal processors?

A. Assembly language
B. Machine language
C. C language
D. Java language

16. A Microprocessor unit, a memory unit and an input/out unit form a:

A. CPU
B. Compiler
C. Microcomputer
D. ALU

17. The Signal is modulated to:

A. Reduce noise and interference
B. Channel assignment
C. Multiplexing or transmission of several messages over a single channel
D. All of the above

18. The analog television systems in current use around the world:

A. NTSC
B. PAL
C.SECAM
D. All of the above

19. Which cellular mobile technology is used in Bhutan?

A. Global System for Mobile Communications (GSM)
B. Code Division Multiple Access (CDMA)
C. Both
D. None of the above

20. An AM demodulator can be implemented with a linear multiplier followed by a _____ filter.

A. Low –pass
B. High-pass
C. Band-pass
D. Band-stop

21. Light may be propagated along a fiber-optic cable in which of the following modes?

A. Multi-mode step index
B. Single-mode step index
C. Multi-mode graded index
D. All of the above

22. The output spectrum of a _____ modulator includes upper-side and lower-side frequencies and the carrier frequency

A. Balanced
B. Standard amplitude
C. Both
D. None of the above

23. Amplitude modulation is a _____ process

A. Multiplication
B. Division
C. Sum/difference
D. None

24. A phase-locked loop (PLL) is a feedback circuit consisting of a

A. Phase detector
B. Low-pass filter
C. VCO
D. All of the above

25. In an analog-to-digital converter, the output of each comparator is connected to an input of a _____

A. Decoder
B. Encoder
C. Multiplexer
D. Demultiplexer

C. 4.3 V
D. 0.2 V

SECTION A

PART – II : Short Answer Questions (20 marks)

Answer ALL the questions. Each question carries 5 marks.

1. What are the basic elements of the communications systems? Explain with diagram.
2. What is AM and FM? Describe a digital modulation?
3. What is a repeater? When and where it is used?
4. What is a feedback? Explain different types of feedback.

SECTION B (50 Marks)

Answer one (1) question only

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1. Cable TV service has gained popularity among the Bhutanese people. If you are recruited as an expert by a new cable operator to design a network, how would you do? Explain the entire designing process along with a final network diagram.

2. Explain the basic principle of cellular mobile networking? Outline the system and technologies involved in providing cellular mobile service. Explain with a block diagram how the signal is processed to connect two subscribers. Your answer should present modulation, processing and transmission with the right choice of radio spectrum.