

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2015
EXAMINATION CATEGORY: TECHNICAL**

**PAPER III: SUBJECT SPECIALIZATION PAPER for
ELECTRONICS & COMMUNICATIONS ENGINEERING**

Date	: 11 October 2015
Total Marks	: 100
Examination Time	: 150 minutes (2.5 hours)
Reading Time	: 15 Minutes (prior to examination time)

GENERAL INSTRUCTIONS:

1. Write your Roll Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is being provided to check the number of pages of Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO SECTIONS**, namely SECTION A and SECTION B:
 - **SECTION A** has two parts: Part I - 30 Multiple-Choice Questions
Part II - 4 Short Answer Questions
All questions under SECTION A are COMPULSORY.
 - **SECTION B** consists of two Case Studies. Choose only **ONE** case study and answer the questions under your choice.
4. All answers should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating any or correct Section, Part and Question Number will NOT be evaluated and no marks would be awarded.
5. Begin each Section and Part in a fresh page of the Answer Booklet.
6. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
7. Use of any other paper including paper for rough work is not permitted.
8. You are required to hand over the Answer Booklet to the Invigilator before leaving the examination hall.
9. This paper has 11 printed pages in all, including this instruction page.

GOOD LUCK!

SECTION A

PART I – Multiple Choice Questions (30 Marks)

Choose the correct answer and write down the letter of the correct answer chosen in the Answer Booklet against the question number. E.g. 31 (c). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

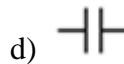
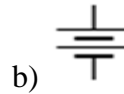
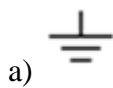
1. An Atom's atomic number is determined by the number of:

- a) Neutron minus Proton
- b) Protons
- c) Neutrons
- d) Electrons

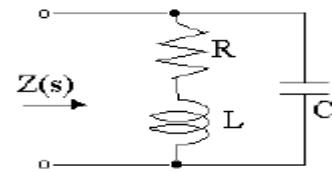
2. A voltage will influence current only if the circuit is:

- a) Open
- b) Insulated
- c) Highly resistance
- d) Closed

3. The battery symbol is:



4. The poles of the impedance $Z(s)$ for the network shown in Figure below will be real and coincident if:

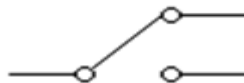


- a) $R = 2\sqrt{\frac{L}{C}}$ b) $R = 4\sqrt{\frac{L}{C}}$
c) $R = \frac{1}{2}\sqrt{\frac{L}{C}}$ d) $R = 2\sqrt{\frac{C}{L}}$

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

- a) Charged once
- b) Used once
- c) Recharged over and over
- d) Stored indefinitely

6. What type of switch is this?



- a) Push button
- b) SPST
- c) DPDT
- d) SPDT

7. In practical applications, battery voltage:

- a) Is restored as soon as disconnect occurs
- b) Is lowered as the load increases
- c) May be stored indefinitely
- d) Will be reduced to zero as power is drawn.

8. In a series RLC circuit with output taken across C, the poles of the transfer function are located at $-a \pm jb$. The frequency of maximum response is given by:

a) $\sqrt{\beta^2 - \alpha^2}$

b) $\sqrt{\alpha^2 - \beta^2}$

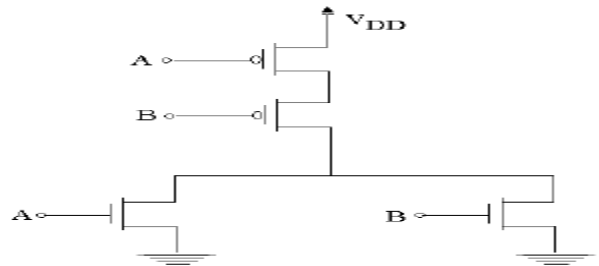
c) $\sqrt{\beta^2 + \alpha^2}$

d) $\sqrt{\alpha\beta}$

9. In a double tuned circuit, consisting of two magnetically coupled, identical high-Q tuned circuits, at the resonance frequency of either circuit, the amplitude response has:

- a) A peak, always
- b) A dip, always
- c) Either peak or dip
- d) Neither peak or dip

10. The circuit shown in Figure below represents _____ gate.



- a) AND
- b) NAND
- c) OR
- d) NOR

11. Active loaded MOS differential circuit has a

- a) High CMMR
- b) Low CMMR

- c) High delay
- d) High differential gain

12. NPN transistor is not suitable for good analog switch because

- a) $I_C - V_{CE}$ characteristic curve pass directly through origin.
- b) The device has very high input impedance.
- c) The device is asymmetrical with an offset voltage $V_{CE\text{off}}$.
- d) It has well defined transition frequency f_T .

13. CMOS logic has the property of

- a) Increased capacitance and delay
- b) Decreased area
- c) High noise margin
- d) Low static power dissipation

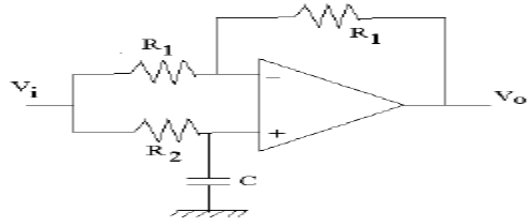
14. A notch filter is a

- a) Wide band pass filter
- b) Narrow band pass filter
- c) Wide band reject filter
- d) Narrow band reject filter

15. For which of the following flip-flops, the output is clearly defined for all combinations of two inputs.

- a) D type flip-flop
- b) R-S flip-flop
- c) J-K flip-flop
- d) None of these

16. The circuit shown in Figure below represent a:



- a) Low Pass filter
- b) High Pass filter
- c) Band Pass filter
- d) None of above

17. The polarization of a dielectric material is given by:

- a) $\vec{P} = \epsilon_r \vec{E}$
- b) $\vec{P} = (\epsilon_r - 1) \vec{E}$
- c) $\vec{P} = \vec{E} \epsilon_0 (\epsilon_r - 1)$
- d) $\vec{P} = (\epsilon_r - 1) \epsilon_0$

18. In a travelling electromagnetic wave, E and H vector fields are:

- a) Perpendicular in space
- b) Parallel in space
- c) E is in the direction of wave travel
- d) H is in the direction of wave travel.

19. A wave is incident normally on a good conductor. If the frequency of a plane electromagnetic wave increases four times, the skin depth, will:

- a) Increase by a factor of 2
- b) Decrease by a factor of 4
- c) Remain the same
- d) Decrease by a factor of 2

20. Electric field intensity due to line charge of infinite length is.

a) $\frac{\rho_L}{2 \pi \epsilon R}$

b) $\frac{\rho_L}{4 \pi \epsilon R}$

c) $\frac{2\rho_L}{\pi \epsilon R}$

d) $\frac{2\rho_L}{4\pi \epsilon R}$

21. The characteristic impedance is given by:

a) $Z_0 = \frac{\sqrt{Z_{oc}}}{Z_{sc}}$

b) $\frac{\sqrt{Z_{sc}}}{Z_{oc}}$

c) $\sqrt{Z_{sc} Z_{oc}}$

d) $(Z_{sc} \cdot Z_{oc})$

22. DMSP stands for:

- a) Distributed Mail System Protocol
- b) Distributed Message System Protocol
- c) Distributed Message System Pool
- d) Distributed Mail System Pool

23. Which Layer is not present in TCP/ IP model?

- a) Application Layer
- b) Internet Layer
- c) Transport Layer
- d) Presentation Layer

24. In TCP protocol header “checksum” is of _____

- a) 8 bits

- b) 16 bits
- c) 32 bits
- d) 64 bits

25. The main function of a browser is to:

- a) Compile HTML
- b) Interpret HTML
- c) De-compile HTML
- d) Interpret CGI programs

26. Which of the following is not a scripting language?

- a) HTML
- b) XML
- c) Postscript
- d) Java script

27. Which of the following is not the Analog to digital (ADC) conversion error?
- a) Differential non-linearity
 - b) Missing code
 - c) Incorrect code
 - d) Offset
28. CMOS logic is probably the best all-around circuitry because of its:
- a) Packing density
 - b) Low power consumption
 - c) Very high noise immunity
 - d) Low power consumption and very high noise immunity.
29. A digital logic device used as a buffer should have what input/output characteristics?
- a) High input impedance and high output impedance
 - b) Low input impedance and high output impedance
 - c) High input impedance and low output impedance
 - d) Low input impedance and low output impedance
30. A data conversion system may be used to interface a digital computer system to:
- a) An Analog out-put device
 - b) A digital out-put device
 - c) An Analog in-put device
 - d) A digital in-put device

PART – II: Short Answer Questions (20 marks)

Answer ALL the questions. Each question carries 5 marks.

1. a) What are the advantages of a digital system over electromechanical system? (2.5 marks)

b) Compare Local Area Network(LAN) and Wide Area Network (WAN) (2.5 marks)
2. With neat block diagram explain data communication model? (5 marks)
3. What is meant by TDMA, how does it work? (5 marks)
4. a) What are the advantages and disadvantages of negative feedback in amplifier? (2.5 marks)

b) What do you mean by Integrated Circuits? What are the advantages of ICs as compared to standard printed circuits? (2.5 marks)

SECTION B

Case Study

Choose either Case 1 or Case 2 from this Section. Each Case carries 50 marks. Mark for each sub-question is indicated in the brackets.

Case Study 1

The Royal Government is planning to introduce people counting system at Phuentsholing Gate, to monitor the number of people leaving and entering Bhutan. Your team has been selected to designing this “people counting system”.

- a) What type of system will be deployed for this project? Explain in detail (15 marks)
- b) Explain why you have chosen this system? (10 marks)
- c) Give details network configuration and explain how it works? (25 marks)

Case Study 2

- a) What are the factors to be considered while selecting digital encoding format? Explain them. (5 marks)
- b) For the binary data 1101001 plot differ digital shift keying modulated wave form and explain the same. (15 marks)
- c) What is the need of multiplexing? Explain different types of multiplexing used in computer networks with diagram (30 marks)

*****TASHI DELEK*****