

**ROYAL CIVIL SERVICE COMMISSION  
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2010  
EXAMINATION CATEGORY: TECHNICAL**

**PAPER II: GENERAL SUBJECT KNOWLEDGE for ENGINEERING GROUP**

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<b>Date</b>	<b>: 23<sup>rd</sup> November 2010</b>
<b>Total Marks</b>	<b>: 100</b>
<b>Examination Time</b>	<b>: 1.5 Hours</b>
<b>Reading Time</b>	<b>: 10 Minutes</b>

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**READ THE FOLLOWING INSTRUCTIONS CAREFULLY**

1. **Do not write** for the first **10 minutes**. This time is to be spent to read the question paper and to check if all questions and pages are correct and intact. Seek any clarifications, if necessary, during this time.
  2. The **maximum time** allotted for writing this paper is **1.5 hours**.
  3. All answers to the question must be written in the separate **Answer Sheet** provided.
  4. This paper consists of **TWO Parts- Part I and Part II**. Part I consists of **70 Multiple Choice questions** and Part II consists of **10 Short Answer questions**. All questions are **compulsory**.
  5. Every correct answer to the questions in Part I shall be awarded with **ONE (1) mark** each and while the correct answers to the questions in Part II shall be awarded with **THREE (3) marks** each.
  6. While answering the multiple choice questions, write only the letter of the correct answer chosen against the question number, clearly and legibly. Any double writing or smudgy answers shall not be evaluated.
  7. The paper has **SIXTEEN (16)** printed pages in all, including the Instruction Page.
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## PART I- MULTIPLE CHOICE QUESTIONS

Choose the correct answer and write down the letter of the correct answer chosen in the Answer Sheet against the question number. Each question carries ONE (1) mark.

### SECTION A: Mathematics

1. Solve for n if ! means factorial.  
 $(n-3)!/(n-4)! = 56$   
n equals:
  - a) 59
  - b) 53
  - c) 18.67
  - d) 168
  
2.  $\frac{d}{dx} \left( \frac{u}{v} \right)$  is equal to:
  - a)  $(u \frac{dv}{dx} - v \frac{du}{dx})/v^2$
  - b)  $(v \frac{du}{dx} - u \frac{dv}{dx})/u^2$
  - c)  $(u \frac{dv}{dx} + v \frac{du}{dx})/v^2$
  - d)  $(v \frac{du}{dx} - u \frac{dv}{dx})/v^2$
  
3. If a dice and a coin are tossed, the probability that you will get a 6 on the dice and tail on the coin is:
  - a) 1/8
  - b) 1/12
  - c) 1/7
  - d) 2/3
  
4.  $\frac{d(\tan(\beta))}{dx}$  is equal to:
  - a)  $\cos^2(\beta) \frac{d\beta}{dx}$
  - b)  $\tan^2(\beta) \frac{d\beta}{dx}$
  - c)  $\sec^2(\beta) \frac{d\beta}{dx}$
  - d)  $\sec(\beta) \frac{d\beta}{dx}$

5.  $\sqrt[3]{80}$  is equal to:

- a)  $\sqrt[3]{10}$
- b)  $2\sqrt[3]{10}$
- c)  $3\sqrt[3]{10}$
- d)  $4\sqrt[3]{10}$

6.  $\int x \cos(x) dx$  is equal to:

- a)  $x \sin(x) + x \cos(x) + C$
- b)  $x \cos(x) + \sin(x) + C$
- c)  $x \sin(x) + \cos(x) + C$
- d)  $\sin(x) + \cos(x) + C$

where  $C$  is an arbitrary constant of integration

7.  $\int_0^2 x \cos(x^2 + 1) dx$  is equal to:

- a)  $\frac{1}{2} (\sin(5) - \sin(1))$
- b)  $\frac{1}{2} (\cos(5) - \cos(1))$
- c)  $\frac{1}{2} (\sin(5) - \cos(1))$
- d)  $\frac{1}{2} (\cos(5) - \sin(1))$

8. 75% of 300 is same as:

- a) 300% of 100
- b) 150% of 150
- c)  $\frac{2}{3}$  of 400
- d)  $\frac{3}{4}$  of 350

9. The second derivative ( $y''$ ) of the function  $y = 3x^5 - 3x^4 + 2x^3 + 10$  is:

- a)  $60x^3 - 36x^2 + 12x$
- b)  $15x^4 - 12x^3 + 6x^2$
- c)  $60x^4 - 12x^2 + 6x$
- d)  $15x^3 - 12x^2 + 6x^2$

10. The value of :

$$\lim_{x \rightarrow 1} \frac{x^2 + 4x - 5}{x - 1} \text{ is:}$$

- a) 5
- b) 6
- c) 7
- d) 8

if 'Lim' means standard limit of functions and ' $x \rightarrow 1$ ' means when  $x$  approaches 1

11. The ratio of a decade and a century is:

- a) 1 : 10
- b) 1 : 5
- c) 1 : 20
- d) 1 : 2

12. If an area of a square is 16 square meters, its perimeter will be:

- a) 32 meters
- b) 16 meters
- c) 16 square meters
- d) 32 square meters

13. The value of  $\frac{\pi}{3}$  radians in degrees is:

- a) 30 degrees
- b) 90 degrees
- c) 120 degrees
- d) 60 degrees

14. If the length of the shadow of a pole is  $\sqrt{3}$  times the actual height of the pole, the angle of elevation of the sun will be:

- a) 60 degrees
- b) 30 degrees
- c) 45 degrees
- d) 15 degrees

15. If  $f(x) = \begin{cases} 2x - 1, & \text{when } x \leq 0 \\ x^2, & x > 0 \end{cases}$

Then  $f\left(\frac{1}{2}\right)$  is:

- a)  $\frac{1}{2}$
- b)  $\frac{1}{4}$
- c)  $\frac{2}{3}$
- d)  $\frac{1}{6}$

16. The area of a quadrilateral whose vertices are (3,4), (0,5), (2,-1) and (3,-2) is:

- a) 11
- b) 22
- c) 33
- d) 44

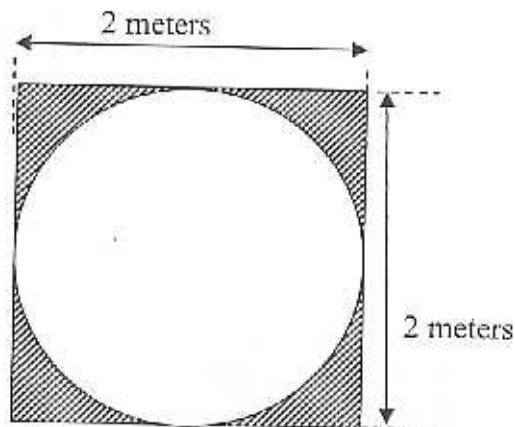
17. A line which intersects a circle at two points is called a:

- a) Tangent
- b) Secant
- c) Interior common tangent
- d) Exterior common tangent

18. Penjor and Choden are two children in a big family. Penjor has thrice as many sisters as he has brothers. Choden has two less brothers than she has sisters. How many children are there in the family?

- a) 13 children : 10 girls and 3 boys
- b) 12 children : 9 girls and 3 boys
- c) 9 children : 6 girls and 3 boys
- d) 8 children : 6 girls and 2 boys

19. In the figure below, the total area of the shaded parts will be:



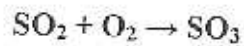
- a) 0.857 square meters
- b) 1.857 square meters
- c) 2.857 square meters
- d) 3.857 square meters

20. If Karma invests Nu 150,000 in Druk PNB shares with a face value of Nu 100 but are being sold at a premium of 25%, the number of shares Karma can buy is:

- a) 1000
- b) 1100
- c) 1200
- d) 1300

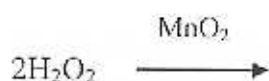
**SECTION B: Chemistry**

21. What is the coefficient for oxygen when this equation is balanced using the lowest whole number?



- a) 1
- b) 2
- c) 4
- d) 6

22. The following reaction will result in the production of



- a)  $\text{H}_2$  and  $\text{O}_2$
- b)  $\text{H}_2\text{O}$
- c)  $\text{H}_2\text{O}$  and  $\text{O}_2$
- d)  $\text{H}_2\text{O}_2$  and  $\text{O}_2$

23. Which change does not lead to an increase in entropy

- a) Mixing Nitrogen and Oxygen gases at room temperature
- b) Cooling steam so that it condenses to water
- c) Heating hexane to its boiling point
- d) Dissolving sugar in water

24. Which is the strongest oxidizing agent?

- a)  $\text{I}_2$
- b)  $\text{I}^-$
- c)  $\text{F}_2$
- d)  $\text{F}^-$

25. B is the chemical symbol of which element?

- a) Beryllium
- b) Boron
- c) Bromine
- d) Barium

26. Density is highest for

- a) Pb
- b) C
- c) Si
- d) Ag

27. Which of the following has the lowest melting point?

- a) N
- b) As
- c) P
- d) Sb

28. Photographic films or plates have.....as an essential ingredient

- a) Silver oxide
- b) Silver bromide
- c) Silver thio sulphate
- d) Silver nitrate

29. Which of the following describes the most alkaline solution

- a) pH 4
- b) pH 5
- c) pH 7
- d) pH 10

30. Half-life of a radioactive substance is 120 days. After 480 days, 4 g will be reduced to:

- a) 2 g
- b) 1 g
- c) 0.5 g
- d) 0.25 g

31. Which of the following is good conductor of electricity in solution state?

- a) Metallic solid
- b) Covalent solid
- c) Molecular solid
- d) An ionic solid

32. Diamond and Graphite are:

- a) Isomers
- b) Isotopes
- c) Allotropes
- d) Polymers

33. The material used in solar cells contains:

- a) Cs
- b) Si
- c) Sn
- d) Ti



34. Glass is a

- a) Micro-crystalline solid
- b) Super cooled liquid
- c) Gel
- d) Polymeric mixture

35. A Catalyst increases the rate of reaction because it

- a) Increases the activation energy
- b) Decreases the energy-barrier for the reaction
- c) Decreases the collision diameter
- d) Increases the temperature coefficient

36. In an electrolytic cell, flow of electrons is from:

- a) Cathode to anode in solution
- b) Cathode to anode through external supply
- c) Cathode to anode through internal supply
- d) Anode to cathode through internal supply

37. Which of the following has the highest calorific value?

- a) Carbohydrates
- b) Fats
- c) Vitamins
- d) Proteins

38. For making good quality mirrors, plates of float glass are used. These are obtained by floating molten glass over a liquid metal which does not solidify before glass. The metal used can be

- a) Mercury
- b) Tin
- c) Sodium
- d) Magnesium

39. Which statement is correct about halogens?

- a) They are all diatomic and form univalent ions
- b) They are all capable of showing several oxidation states
- c) They are all diatomic and form divalent ions
- d) They can mutually displace each other from the solution of their compounds

40. Which of the following is not emitted by a radioactive substance?

- a)  $\alpha$  rays
- b)  $\beta$  rays
- c) positron
- d) proton

**SECTION C: Physics**

41. Which of the following contains three scalar quantities?

- a) Mass, distance, speed
- b) Density, force, mass
- c) displacement, acceleration, mass
- d) velocity, momentum, temperature

42. Which Newton's law states that "an object continues in uniform motion in a straight line or at rest unless a resultant external force acts"

- a) Newton's 1<sup>st</sup> law
- b) Newton's 2<sup>nd</sup> law
- c) Newton's 3<sup>rd</sup> law
- d) All of the above

43. A 1.1 kW electric kettle is plugged into the 220 V mains supply, the current drawn is

- a) 0.005 A
- b) 0.05 A
- c) 0.5 A
- d) 5 A

44. The light year is the distance traveled by light in

- a) One year
- b) Two years
- c) Three years
- d) None of the above

45. The SI unit of electric current is

- a) Volt
- b) Ampere
- c) Ohm
- d) Mole

46. If the temperature in Kelvin scale is 273 Kelvin, then the temperature in degree scale would be equal to

- a)  $100^{\circ}\text{C}$
- b)  $50^{\circ}\text{C}$
- c)  $25^{\circ}\text{C}$
- d)  $0^{\circ}\text{C}$

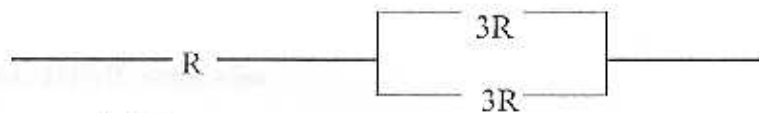
47. Which of the following laws states that “ at constant pressure, the volume of a gas is proportional to its temperature in Kelvin”

- a) Pressure law
- b) Charles law
- c) Boyles law
- d) Snell’s law

48. A glass rod is rubbed with silk, it acquires a positive charge because

- a) Protons are added to it
- b) Protons are removed from it
- c) Electrons are added to it
- d) Electrons are removed from it.

49. Referring to the figure below, the effective resistance of the network is



- a)  $2R$
- b)  $4R$
- c)  $10R$
- d)  $5R/2$

50. When length of a metal rises, its electrical resistance

- a) Increases
- b) Decreases
- c) Does not change
- d) None of the above.

51. Two free parallel wires carrying currents in the opposite direction

- a) Attract each other
- b) Repel each other
- c) do not affect each other
- d) get rotated to be perpendicular to each other

52. Eddy currents are minimized by:
- a) Lubrication
  - b) Using high frequency magnetic field
  - c) Using core in laminated form
  - d) None of the above
53. Alternating Current (AC) is used in homes because
- a) It is not dangerous
  - b) It is easily reproducible
  - c) It is cheap
  - d) It is economical in transmission
54. A motor is a device which converts
- a) A.C into D.C
  - b) D.C into A.C
  - c) Mechanical energy into electrical energy
  - d) Electrical energy into mechanical energy
55. A car accelerates uniformly from rest. After 8 seconds, it has traveled a distance of 120 meters (m), the average acceleration of the car is
- a)  $60 \text{ m/s}^2$
  - b)  $15 \text{ m/s}^2$
  - c)  $3.75 \text{ m/s}^2$
  - d)  $9.6 \text{ m/s}^2$
56. .... is the instrument used to measure current
- a) Voltmeter
  - b) Manometer
  - c) Ammeter
  - d) Ohm-meter
57. Increasing the charge on the plates of a capacitor means
- a) Increasing the capacitance
  - b) Increasing the potential difference between the plates
  - c) Both a and b
  - d) None of the above

58. When the number of turns in a solenoid is doubled without any change in the length of the solenoid, its self induction will be
- Four times
  - Doubled
  - Halved
  - Squared
59. Phenomenon of scattering of light has found its applications in the following case
- Blue color of the sky
  - Reddish color of the sky at sunrise and sunset
  - Use of red light in danger signals
  - All of the above
60. On hot days, sometimes we can see mirages. The reason for this is
- The refractive index of atmosphere increases as we go from greater to lower heights.
  - The hot air acts as a mirror
  - Air currents are set up in the atmosphere
  - The refractive index of the atmosphere increases with height

**SECTION D: General IT Knowledge**

61. HTML stands for:
- Hyper Text Mailing Language
  - Hyper Text Markup Language
  - Hyper Text Market Language
  - Hyper Text Mailer's Language
62. One byte represents:
- a word
  - eight characters
  - eight bits
  - a single digit with two possible states
63. Of the following choices, the largest measurement of storage is a:
- gigabyte
  - kilobyte
  - megabyte
  - terabyte

64. Which of the following best describes the difference between the Internet and the WWW?
- a) The Internet is the physical network of global computers, and the WWW is many hypertext documents distributed globally over many computers.
  - b) The Internet carries traffic for schools, government offices, and other public organizations, while the WWW carries commercial traffic.
  - c) The Internet is the collection of computers, and the WWW is the wiring and transmission protocols that connect them.
  - d) The Internet consists of software programs such as e-mail and IRC, while the WWW is a collection of Web pages.
65. Which portion of the URL below records the directory or folder of the desired resource?  
<http://www.bhutannews.com/sports/archery.htm>
- a) http
  - b) sports
  - c) archery.htm
  - d) www.bhutannews.com
66. If a computer on a network shares resources for others to use, it is called.....
- a) Server
  - b) Client
  - c) Mainframe
  - d) None of the above
67. ASCII stands for
- a) American Stable Code for International Interchange
  - b) American Standard Case for Institutional Interchange
  - c) American Standard Code for Information Interchange
  - d) American Standard Code for Interchange Information
68. The language that the computer can understand and execute is called
- a) Machine language
  - b) Application software
  - c) System program
  - d) All of above
69. A protocol is a set of rules governing a time sequence of events that must take place
- a) between peers
  - b) between an interface
  - c) between modems
  - d) across an interface

70. RAM stands for

- a) Rapid Access Memory
- b) Random Access Memory
- c) Read Access Memory
- d) Remote Access Memory

## PART II- SHORT ANSWER QUESTIONS

Answer all questions. Answers to all questions must be written in the separate answer sheet provided. Each question carries THREE (3) marks.

1. Divide  $\frac{(x^4 - 3x^2 + 7x - 10)}{(x-2)}$
2. Solve:  $2x^2 - 36x + 162 = 32$
3. A right angled triangle has a perimeter of 24 cm and a hypotenuse of 10 cm. Find the sides  $x$  and  $y$ ,  $y > x$ , that make the right angle of the triangle.
4. Two spheres of charges  $+20$  and  $+80$  coulomb are placed 15 cm apart. Find the position of the point between them where the intensity is zero.
5. Why sodium chloride is not a good conductor of electricity in solid state but conducts electricity in molten state?
6. Why is alum added to water for purification?
7. A ray of light from a luminous object is brought to focus at a point A. A convex lens of 24 cm focal length is then placed 24 cm from A, so as to intercept the rays before they meet at A. If, now they meet at B, find the distance AB.
8. What is Fleming's left hand rule?
9. What is nuclear fission reaction?
10. What do you understand by Artificial Intelligence?