ROYAL CIVIL SERVICE COMMISSION

CIVIL SERVICE COMMON EXAMINATION (CSCE) 2009

EXAMINATION CATEGORY: TECHNICAL

PAPER II: GENERAL SUBJECT KNOWLEDGE for ENGINEERING GROUP

Date : 7 November 2009
Total Marks : 100
Examination Time : 1.5 Hours
Reading Time : 10 Minutes

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 questions 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 while correct answers to 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. This paper has **SIXTEEN (16) printed pages** in all, including the Instruction Page.

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. 56 is what percent of 80?

   a) 66%
   b) 70%
   c) 80%
   d) 142%

2. What is the probability of getting a "king card" from a pack of 52 cards?

   a) 1/13
   b) 1/19
   c) 4/13
   d) 3/52

3. In a bowl containing 10 marbles, 5 are yellow and 5 are green. If 2 marbles are picked from the bowl, in separate draws, what is the probability that they will both be green?

   a) 2/5
   b) 1/2
   c) 2/9
   d) 1/4

4. The determinant of the matrix A = $\begin{bmatrix} -5 & 0 \\ 1 & 8 \end{bmatrix}$ is:

   a) –39
   b) –40
   c) 13
   d) 40

5. Lhaden wants to hang 3 paintings on her wall. She has 6 paintings to choose from. How many arrangements of paintings on the wall can she create?

   a) 6
   b) 30
   c) 90
   d) 120

6. How much longer, *in seconds*, is required to drive 1 mile at 40 miles per hour than at 60 miles per hour?

   a) 0.5
   b) 30
   c) 40
   d) 60

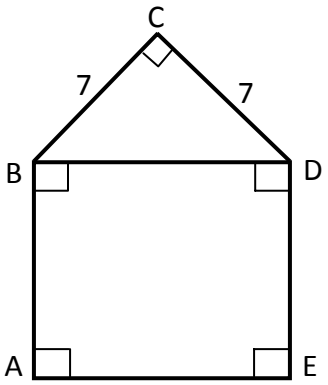
7. Shop No. 7 offered 20% discount on all items during the Thimphu Tsechu sale. Ap Naka paid Nu. 100 for an umbrella which he bought during the sale. What was the actual price of the umbrella?

   a) Nu. 80
   b) Nu. 96
   c) Nu. 120
   d) Nu. 125

8. 40% of 210 is the same as one third of?

   a) 84
   b) 252
   c) 280
   d) 630

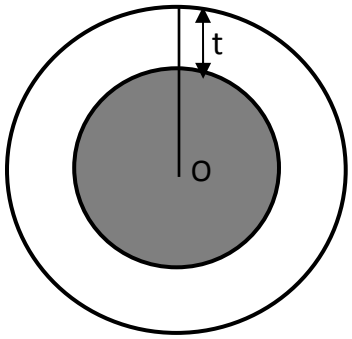
Note:
The geometric figure given below is to be used with Question 9. (Figure not drawn to scale)



9. In the figure given above, what is the area of the square ABDE?

   a) $28\sqrt{2}$
   b) 49
   c) 98
   d) $98\sqrt{2}$

Note:
The geometric figure given below is to be used with Question 10. (Figure not drawn to scale)



10. In the wheel above, with center O, the area of the entire wheel is 169π. If the area of the shaded hubcap is 144π, then the value of 't' is:

a) 1
b) -1
c) 1.5
d) 3

11. Norbu's parents invested Nu. 3200 in the bank when he was born at 7% per annum simple interest. How much money will be there in Norbu's account on his 10^{th} birthday?

a) Nu. 224
b) Nu. 2240
c) Nu. 5440
d) Nu. 22,400

12. The price of momos per plate in 2008 was Nu. 20 and it is Nu. 25 in 2009. The 'price relative' in the year 2009 is:

a) 20% increase
b) 25% increase
c) 80% increase
d) None of the above

13. $\text{Cos}(\pi - x)$ is equal to:

a) Cos x
b) –Cos x
c) Sin x
d) –Sin x

14. When the expression $3x^3+8x^2-6x+1$ is divided by $x+3$, the remainder will be:

a) 10
b) –10
c) 28
d) 172

15. If x and y are positive integers, and if $x^2+2xy+y^2 = 25$, then $(x+y)^3$ is equal to:

a) 15
b) 75
c) 120
d) None of the above

16. What is the area of a rectangle whose length is twice its width and whose perimeter is equal to that of a square whose area is 1?

a) 6
b) 2/3
c) 4/3
d) 8/9

17. If $7x+3y=17$ and $3x+7y=19$, what is the average (arithmetic mean) of x and y?

a) 1.8
b) 18
c) 3.6
d) 36

18. Yonten will be *x* years old *y* years from now. How old was he *z* years ago?

a) x+y+z
b) x–y–z
c) x+y–z
d) x–y+z

19. If $3^a \times 3^b = 3^{100}$ what is the average (arithmetic mean) of *a* and *b*?

a) 25
b) 50
c) 100
d) 200

20. At 3.00 A.M. the temperature was 13° below zero. By noon it had risen to 32°. What was the average hourly increase in temperature?

a) 3.2°
b) 2.1°
c) 5°
d) 7.5°

SECTION B: Chemistry

21. Alexander Fleming discovered

a) penicillin
b) X-ray
c) ultrasound
d) ECG

22. W is the chemical symbol for which element?

a) mercury
b) silver
c) tin
d) tungsten

23. The relative atomic mass of an element is the result of comparing mass of one atom of the element to ……....of the mass of carbon atom:

a) 1/10
b) 1/12
c) 1/14
d) 1/16

24. Two solutions X and Y are separated by a semi-permeable membrane. If solution X has higher osmotic pressure than solution Y, osmosis will occur from

a) X to Y
b) Y to X
c) Both ways
d) No osmosis will occur

25. Which of the following describes the most acidic solution?

a) pH 4
b) pH 5
c) pH7
d) ph 14

26. All of the following are organic compounds EXCEPT

a) nucleic acids
b) proteins
c) water
d) carbohydrates

27. Molality of a solution is defined as the number of moles of solute dissolved per……..grams of the solvent

a) 10
b) 100
c) 500
d) 1000

28. Substances which cannot be broken down into simpler substances by ordinary chemical reactions are called

a) atoms
b) elements
c) compounds
d) molecules

29. Atomic Number is the total number of …….in an Atom.

a) protons
b) neutrons
c) moles
d) electrons

30. A 500g toothpaste sample has 0.2g fluoride concentration. What is the concentration of fluorine in terms of ppm level?

a) 4×10^{-3}
b) 100
c) 400
d) 2.5×10^{9}

31. Hydrogen bomb is based on

a) nuclear fission
b) nuclear fusion
c) atomic fission
d) none of the above

32. Complete the following chemical equation

$$CH_3COOH + 2H_2 \xrightarrow{\text{Copper Chromite}} CH_3CH_2OH + \ldots\ldots\ldots\ldots$$

a) O_2
b) 2H
c) H_2O
d) $2H_2O$

33. Radiocarbon dating is an important technique used for the determination of the ……..of the objects of animal or vegetable origin

a) weight
b) temperature
c) colour
d) age

34. The minimum energy required for molecules to enter into chemical reaction is called

a) kinetic energy
b) potential energy
c) threshold energy
d) activation energy

35. The most suitable indicator for the titration of a weak acid against a strong base is

a) phenolphthalein
b) thymol blue
c) litmus
d) methyl orange

36. *915 fine silver* has a silver content of

a) 8.5%
b) 9.15%
c) 91.5%
d) 100%

37. Which of the following is used in the manufacture of safety matches?

a) white phosphorus
b) red phosphorus
c) yellow phosphorus
d) black phosphorus

38. Which of the following is liquid at room temperature?

a) bromine
b) chlorine
c) fluorine
d) iodine

39. According to Boyle's Law, a decrease in the pressure of a gas occurs when the

a) volume is increased
b) volume is decreased
c) temperature is increased
d) temperature is decreased

40. Classify the type of reaction for the reaction $Fe_2S_3 = 2Fe + 3S$

a) double replacement
b) single replacement
c) decomposition
d) combination

SECTION C: Physics

41. A velocity of $20ms^{-1}$ is equal to:

a) 0.72 km/hr
b) 72 m/hr
c) 72 km/hr
d) 720 km/hr

42. Which Newton's Law states that *"for every action there is an equal and opposite reaction"*?

a) Newton's 1st Law
b) Newton's 2nd Law
c) Newton's 3rd Law
d) All of the above

43. A particle completes its journey along the circumference of a circle of radius 10cm in 4 seconds. What is the average speed and velocity of the particle?

a) 1.57 ms^{-1} and 15.7 ms^{-1} respectively
b) 15.708 ms^{-1} and 0 respectively
c) 157.08 ms^{-1} and 15.07 ms^{-1}
d) None of the above

44. A moving body is covering distance in proportion to the square of time along a straight line. The acceleration of the body is:

a) increasing
b) decreasing
c) constant
d) zero

45. A 1000kg vehicle is moving with a velocity of 10 ms^{-1}. What is the magnitude of force which can increase its velocity to 25 ms^{-1} in 5 seconds?

a) 1000 N
b) 1500 N
c) 2500 N
d) 3000 N

46. Energy is expressed in the same unit as

a) force
b) momentum
c) work
d) pressure

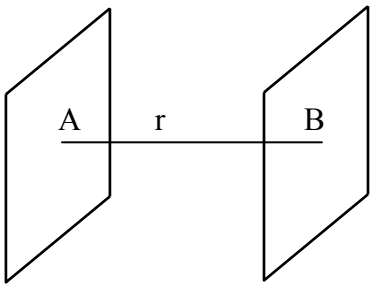
47. If the temperature of a certain bath gives the same reading on both the centigrade and Fahrenheit scales, the temperature of the bath is:

a) –40°C or –40°F
b) 32°C or 32°F
c) 180°C or 180°F
d) None of the above

48. When two capacitors are connected in parallel, the system has ……. times the capacity of that obtained when they are connected in series.

a) two
b) three
c) four
d) six

49. In the following figure, two parallel equipotential surfaces A and B are kept at a small distance 'r' from each other. In taking a point charge of –q coulomb from surface A to surface B, what will be the net work done? (E_0 is the permittivity of free space)



a) Zero
b) $-(1/4\,\pi E_0)(q/r)$
c) $-(1/4\,\pi E_0)(q/r^2)$
d) $(1/4\,\pi E_0)(q/r^2)$

50. Given that the charge on an electron is 1.6×10^{-19} coulomb, the number of electrons flowing per second through the filament of a 120 V, 60 W bulb is:

a) 3125
b) 3.125×10^{18}
c) 3.125×10^{-18}
d) 31.25×10^{18}

51. A law in physics states that *"the algebraic sum of currents meeting at a point is zero"*. What is this law called?

a) Ohm's law
b) Coulomb's law
c) Kirchhoff's voltage law
d) Kirchhoff's current law

52. Light year is related to

a) energy
b) speed
c) distance
d) time

53. …… is the instrument to measure the pressure of gases

a) barometer
b) manometer
c) ammeter
d) none of the above

54. The unit of *resistivity* is

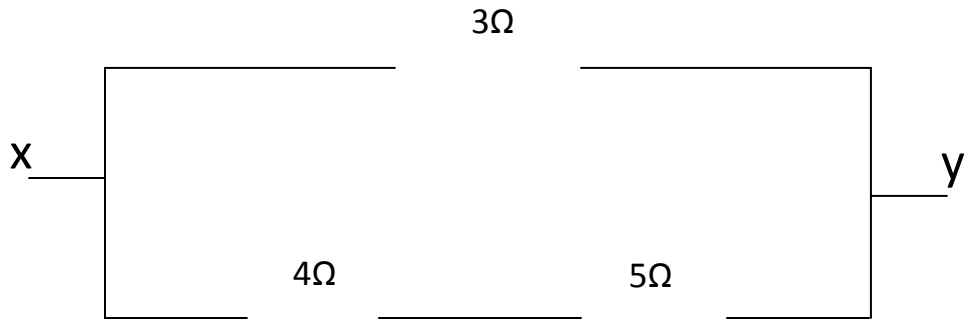
a) ohm
b) ohm/m
c) ohm/m²
d) ohm-m

55. A car is running at a speed of 10km/hr while another car having same mass is running at a speed of 20 km/hr. What is the ratio of their kinetic energies?

a) 1:4
b) 4:1
c) 1:2
d) 2:1

56. What is the equivalent resistance between points X and Y in the circuit given below?

a) 0.45 Ω
b) 2.25 Ω
c) 3.45 Ω
d) 12 Ω



57. A photo electric cell is a device which converts

a) chemical energy into electrical energy
b) magnetic energy into electrical energy
c) electrical energy into nuclear energy
d) light energy into electrical energy

58. Wright Brothers are associated with the invention of

a) helicopters
b) steam engine
c) diesel generators
d) all of the above

59. The intensity of earthquakes is measured with

a) polygraph
b) hydrometer
c) seismograph
d) none of the above

60. The phenomenon by virtue of which a wave going from one medium to another undergoes a change in velocity is called

a) reflection
b) refraction
c) polarization
d) radiation

SECTION D: General IT Knowledge

61. The brain of the computer is the

a) RAM
b) CPU
c) ROM
d) BIOS

62. The Internet was originally developed by

a) computer hackers
b) the university of Michigan
c) the U.S. Department of Defense
d) Bill Gates

63. What is a URL?

a) a software
b) a type of UFO
c) an acronym for Unlimited Resources for Learning
d) the address of a document or "page" on the World Wide Web

64. 1MB is equal to

a) 1000 bytes
b) 1024 KB
c) 1240 KB
d) none of the above

65. Which file extensions indicate only graphics files?

a) BMP and DOC
b) JPEG and TXT
c) TXT and STK
d) BMP and GIF

66. The computer abbreviation FDD means

a) Format Disk Drive
b) Fast Disk Drive
c) Fixed Disk Drive
d) File Disk Drive

67. In a computer network, which device acts as a traffic cop?

a) router
b) hub
c) switch
d) modem

68. Adobe Photoshop is associated with

a) music recording
b) sound mixing
c) poster design
d) movie editing

69. Windows Vista is an example of

a) an external drive
b) an application software
c) a system software
d) an internet enabling tool

70. In the URL http://www.delhiuniversity.edu.in , the word 'in' stands for

a) Internal
b) International
c) Interchange
d) India

PART II- SHORT ANSWER QUESTIONS

Answer all questions. Each question carries THREE (3) marks.

1. Solve:

$$\frac{\sqrt{2}-\sqrt{3}}{\sqrt{2}+\sqrt{3}} + \frac{\sqrt{2}+\sqrt{3}}{\sqrt{2}-\sqrt{3}}$$

2. One set of 100 observations has the mean as 15 and another set of 150 observations has the mean as 16. Find the mean of 250 observations by combining the two sets of given observations.

3. Differentiate the function $y= (3x+2)^8$

4. One litre sample of sea water is found to contain 5.8×10^{-3}g of dissolved oxygen. Calculate the concentration of dissolved oxygen in the sea water in ppm if the density of sea water is 1.03 gcm^{-3}.

5. What do you mean by "fermentation"?

6. Complete and balance the following equations

   i) $Ag + O_3 \longrightarrow$ …… + ……..

   ii) $CuSO_4 \xrightarrow{heat}$ …… + ……..

7. Prove that the focal length of a plano-convex lens is equal to twice the radius of curvature of its curved surface. Refractive Index of glass is 3/2.

8. Define magnetic susceptibility.

9. A string of decoration light is formed by joining in series 22 bulbs of 12V each. When joined across 220V mains, the power consumption is found to be 26.4 watts. Calculate the resistance of each bulb.

10. Explain the following with respect to computer networking:

    i) Peer-to-Peer network
    ii) Local Area Network
    iii) Wide Area Network