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

PAPER II: GENERAL SUBJECT KNOWLEDGE for *ENGINEERING* GROUP

Date	: 10 October 2015
Total Marks	: 100
Examination Time	: 90 minutes (1.5 hours)
Reading Time	: 15 Minutes (prior to examination time)

GENERAL INSTRUCTIONS:

1. Write your Registration Number clearly and correctly in 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 PARTS**, **namely Part I and Part II:**

   Part I consists of 70 Multiple Choice Questions of 1 (one) mark each; and
   Part II consists of 10 Short Answer Questions of 3 (three) marks each.

4. **All questions are COMPULSORY.**
5. All answers must be written in the Answer Booklet provided to you. You will not be given any marks for answers written other than in the Answer Booklet. Ask for additional Answer Booklet if required.
6. 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.
7. Begin each Part in a fresh page of the Answer Booklet.
8. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
9. You are required to hand over the Answer Booklet to the Invigilator before leaving the examination hall.
10. This paper has 16 printed pages in all, including this instruction page.

Good Luck!

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. E.g. 70 (a). Each question carries ONE mark.

SECTION A: Mathematics

1. What name is given to the longest side of a triangle?

    a. Angle
    b. Hypotenuse
    c. Isosceles
    d. Tangent

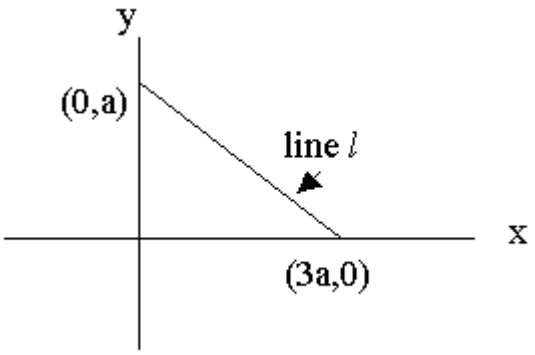
2. $3x + y = 19$ and $x + 3y = 1$
   Find the value of $2x + 2y$.

    a. 20
    b. 18
    c. 11
    d. 10

3. Thinley's coin collection contains US, Indian and Norwegian coins. If the ratio of US to Indian coins is 5 to 2 and the ratio of Indian to Norwegian coins is 5 to 1, what is the ratio of US to Norwegian coins?

    a. 5:1
    b. 10:5
    c. 15:2
    d. 25:2

Use the figure below to answer question No. 4.



4. In the figure above, what is the slope line 'L'?

   a. -3
   b. -1/3
   c. 0
   d. 1/3

5. Six years ago Tashi was P times as old as Dorji was. If Tashi is now 17 years old, how old is Dorji now in terms of P?

   a. 11/P + 6
   b. P/11 +6
   c. 17 - P/6
   d. 17/P

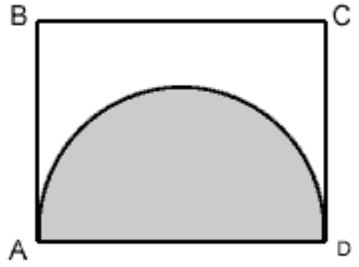
6. If f (3) = 15 and f (5) = 45, which of the following could be f (x)?

   a. $4x + 3$
   b. $2x^2 – 2x$
   c. $2x^2 - x$
   d. $2x^2 - 5$

7. Volunteers are needed to prepare for the upcoming events. Each volunteer can dig either 2 large holes per hour, or 35 small holes per hour to hoist different size flags. The volunteers are given 3 hours within which they need to dig 20 large holes and 700 small holes. How many volunteers are required?

   a. 10
   b. 15
   c. 20
   d. 25

8. Rectangle ABCD has a perimeter of 26. The half circle with diameter AD has an area of 8π. What is the perimeter of the part of the figure that is not shaded?



(figure not to scale)

a. $26 + 4\pi$
b. $18 + 8\pi$
c. $18 + 4\pi$
d. $14 + 4\pi$

9. The average IQ of 4 people is 110. If three of them each have an IQ of 105, what is the IQ of the fourth person?

a. 125
b. 105
c. 115
d. 110

10. **76967.** This sequence of numbers are called:

a. Palindrome
b. Unique numbers
c. Whole numbers
d. Prime numbers

11. $(\sqrt{2} - \sqrt{3})^2 =$

a. $5 - 2\sqrt{6}$
b. $5 - \sqrt{6}$
c. $1 - 2\sqrt{6}$
d. $1 - \sqrt{2}$

12. Which of the following could be a solution of the equation $|x| = |4x - 3|$?

a. -1
b. -0.6
c. 0
d. 0.6

13. The table shows the amount paid as bonuses to the employees of certain firms.

Bonus paid to an employee (Nu.)	500.00	1000.00	1500.00	2000.00
Number of employees	7	37	4	2

The average bonus per employee was:

a. Nu. 810.00
b. Nu. 910.00
c. Nu. 1000.00
d. Nu. 1010.00

14. After being dropped a certain ball always bounces back to 2/5 of the height of its previous bounce. After the first bounce it reaches a height of 125 cm. How high (in cm) will it reach after its fourth bounce?

a. 20
b. 15
c. 8
d. 5

15. At what point does the graph of $5x + 4y = 12$ intersect the y-axis?

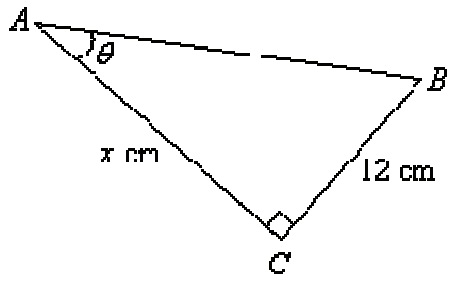
a. (0, 3)
b. (3, 0)
c. (0, -3)
d. (5, 0)

16. Tashi covered a distance of 50 km on his first trip. On a later trip he traveled 300 km while going three times as fast. His new time compared with the old time was:

a. three times as much
b. twice as much
c. the same
d. half as much

17. The percentage profit earned by selling stack of books for Nu. 1920 is equal to the percentage loss incurred by selling the same stack of books for Nu. 1280. At what price should the article be sold to make 25% profit?

a. Nu. 2000
b. Nu. 2200
c. Nu. 2400
d. Nu. 3000



18. In the figure above, the length of the side 'x' given that sin θ = 0.6 is:

a. 17 cm
b. 16 cm
c. 14 cm
d. 8 cm

19. The missing number in this Fibonacci series of 21, 34, 55, 89,……., 233 is:

a. 95
b. 102
c. 144
d. 201

20. If f(x) = sin x, what is f □ (x)?

a. Cos x
b. Tan x
c. – Sin x
d. Cos x Tan x

SECTION B: Chemistry

21. The gas used for artificial ripening of green fruit is:

a. Ethylene
b. Ethane
c. Carbon Dioxide
d. Acetylene

22. Sucrose, ordinary table sugar, may be classified as

a. Monosaccharide
b. Disaccharide
c. Polysaccharide
d. Oligosaccharide

23. The atoms in sugar are bound by what type of bond?

a. Ion
b. Hydrogen
c. Covalent
d. Van der Waals

24. Steel is an alloy of iron and ……..

a. Lead
b. Copper
c. Aluminum
d. Carbon

25. Which gas is produced by rotting vegetation?

a. Oxygen
b. Carbon Monoxide
c. Carbon dioxide
d. Methane

26. What is acetic acid commonly known as?

a. Baking soda
b. Washing Soda
c. Vinegar
d. Aspirin

27. Heavy water freezes at:

a. 0˚C
b. 3.8˚C
c. 0.38˚C
d. -0.38˚C

28. The chemical symbol for Tin is:

a. Tn
b. Sn
c. Ti
d. Nt

29. The monomer of polythene is:

a. Vinyl Chloride
b. Ethylene
c. Ethyl alcohol
d. None of the above

30. The number of water molecules present in a drop of water volume (0.0018 ml) at room temperature is:

a. 1.568×10^3
b. 6.023×10^{19}
c. 4.84×10^{17}
d. 6.023×10^{23}

31. In the following chemical equation, identify the highlighted product. This product is used mostly in farming.

$$COCl_2 + 4\ NH_3 \rightarrow \mathbf{(NH_2)_2CO} + 2\ NH_4Cl$$

a. Isocyanic acid
b. Biuret
c. Ammonium Carbamate
d. Carbamide

32. The number of electrons present in H^+ is

a. Zero
b. One
c. Two
d. Three

33. The isomerism which exists between CH_3CHCI_2 and CH_2CI. CH_2CI is:

a. Chain isomerism
b. Functional group isomerism
c. Positional isomerism
d. Metamerism

34. The iron ore magnetite consists of:

a. Fe_2O_3
b. Fe_3OH_4
c. $FeCO_3$
d. $3Fe_2O_3$ ……$3H_2O$

35. After balancing the following chemical equation, the number of Hydrogen atoms on both reactants and products side of the equation is:

$Mg(OH)_2 + HCl$ ---------- > $MgCl_2 + H_2O$

a. 2
b. 4
c. 3
d. 6

36. _____ + $6O_2$ = $6CO_2$ + $6H_2O$ + Energy

The missing compound is:

a. $C_6H_{12}O_6$
b. C_2H_5OH
c. $C_{12}H_{22}O_{11}$
d. C_2H_4

37. During the acid- base titration process, phenolphthalein is used as an indicator for the pH change in the solution. If the solution changes to pink using this indicator, the solution is said to be:

a. Base
b. Acid
c. Neutral
d. Titrant

38. The names of the scientists, Newlands, Mendeleev, and Meyer are associated with the development of :

a. Atomic structure
b. Periodic table of contents
c. Metallurgy
d. Discovery of elements

39. What type of solid materials are typically hard, have high melting points and poor electrical conductivities?

I. Ionic
II. Metallic
III. Covalent – network

a. I and II only
b. II and III only
c. I and III only
d. I, II and III

40. What is the best definition for *electronegativity?*

a. Electronegativity is the energy required for a gaseous atom to gain an electron.
b. Electronegativity is the attraction of an atom for a bonding pair of electrons.
c. Electronegativity is the attraction between the nucleus and the valance electrons of an atom.
d. Electronegativity is the ability of an atom to attract electrons from another atom.

SECTION C: Physics

41. The absorption of the ink by blotting paper involves:

a. Viscosity of the ink
b. Capillary action phenomenon
c. Diffusion of ink through blotting
d. Siphon action

42. Large transformers, when used for some time, become very hot and are cooled by circulating oil. The heating of the transformer is due to

a. the heating effect of current alone
b. both the heating effect of current and hysteresis loss
c. hysteresis loss alone
d. intense sunlight at noon

43. Lux is the SI Unit of

a. intensity of illumination
b. luminous efficiency
c. luminous flux
d. luminous intensity

44. Distribution of energy in the spectrum of a black body can be correctly represented by

a. Wien's law
b. Planck's law
c. Stefan's law
d. Kirchhoff's law

45. When work is done on the body by an external force, its

a. Only kinetic energy increases
b. Only potential energy increases
c. Both kinetic and potential energy may increase
d. Sum of kinetic and potential energy remain constant

46. A body of mass 10 kg is dropped to the ground from a height of 10 metres. The work done by the gravitational force is (assume $g = 9.8\ m/s^2$)

a. -490 Joules
b. -980 Joules
c. +490 Joules
d. +980 Joules

47. If the stone is thrown up vertically and return to ground, its potential energy is maximum

a. during the upward journey
b. during the return journey
c. at the maximum height
d. at the bottom

48. An electric lamp is connected to 220 V, 50 Hz supply. Then the peak value of voltage is

a. 210 V
b. 311 V
c. 211 V
d. 320 V

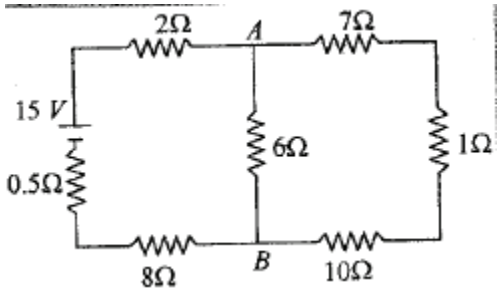
49. Radioactivity is

a. Irreversible process
b. Spontaneous process
c. Self disintegration process
d. All of the above

50. The phenomenon by which light travels in an optical fibers is

a. Reflection
b. Total internal reflection
c. Refraction
d. Transmission

51. The current from the battery in circuit diagram shown is



a. 1 A
b. 1.5 A
c. 2 A
d. 3 A

52. Two wires of the same material are given. The first wire is twice as long as the second and has twice the diameter of the second. The resistance of the first will be

a. Twice of the second
b. Equal to the second
c. Half of the second
d. Four times of the second

53. Hook's law defines

a. Stress
b. Modulus of elasticity
c. Strain
d. Elastic limit

54. When NPN transistor is used as an amplifier

a. Electrons move from base to collector
b. Electrons move from collector to base
c. Holes move from emitter to base
d. Holes move from base to emitter

55. Which of the following logic gate is an universal gate?

    a. OR
    b. AND
    c. NOT
    d. NOR

56. A body is just floating on the surface of a liquid. The density of the body is same as that of the liquid. The body is slightly pushed down. What will happen to the body?

    a. It will slowly come back to its earlier position
    b. It will sink
    c. It will remain submerged, where it is left
    d. It will come out violently

57. Work done by a frictional force is

    a. Negative
    b. Zero
    c. Positive
    d. All of the above

58. The value of 'g' at a particular point is 9.8 m/s^2. Suppose the earth suddenly shrinks uniformly to half its present size without losing any mass. The value of 'g' at the same point (assuming that the distance of the point from the centre of earth does not shrink) will now be

    a. 4.9 m/s^2
    b. 9.8 m/s^2
    c. 3.1 m/s^2
    d. 19.6 m/s^2

59. A spring balance is attached to the ceiling of a lift. A man hangs his bag on the spring and the spring reads 49 N, when the lift is stationary. If the lift moves downward with an acceleration of 5m/s^2 the reading of the spring balance will be

    a. 49 N
    b. 74 N
    c. 24 N
    d. 15 N

60. In which process, the rate of heat of transfer is maximum

a. Conduction
b. Convection
c. Radiation
d. In all these, heat is transferred with the same velocity

SECTION D: General IT Knowledge

61. A computer program that converts assembly language to machine language is

a. Compiler
b. Interpreter
c. Assembler
d. Comparator

62. Hard disks are formatted in the same manner as floppy disks. However, before a hard disk can be formatted, it must first be

a. Partitioned
b. Write-protected
c. Inter-sectioned
d. Deleted

63. The most common format for a home video recorder is VHS. VHS stands for...?

a. Video Home System
b. Very high speed
c. Voltage house standard
d. Video horizontal standard

64. The binary system uses powers of

a. 2
b. 10
c. 8
d. 16

65. Frames from one LAN can be transmitted to another LAN via the device

a. Router
b. Bridge

c. Repeater
d. Modem

66. Which of the following program is not a utility?

a. Debugger
b. Editor
c. Spooler
d. All of the above

67. On the PC side, the printer port is

a. 25 pin female serial connector
b. 15 pin female parallel connector
c. 25 pin female parallel connector
d. 25 pin male serial connector

68. How many digits of the DNIC (Data Network Identification Code) identify the country?

a. First three
b. First four
c. First five
d. First six

69. Which device of computer operation dispenses with the use of the keyboard?

a. Joystick
b. Light pen
c. Mouse
d. Touch

70. A program that is employed in the development, repair or enhancement of other programs is known as

a. System software
b. Software tool
c. Applications program
d. Utility program

PART II: SHORT ANSWER QUESTIONS

Answer all questions. Each question carries THREE marks.

1. Find the particular solution to the differential equation dy/dx = xy + x which satisfies y = 3 when x = 0. Show your work.

2. A man has $ 10,000 to invest. He invests $ 4000 at 5 % and $ 3500 at 4 %. In order to have a yearly income of $ 500, what rate does he need to invest the remainder at?

3. Dorji sold two pens at Nu.1.20 each. Based on the cost, his profit was 20% and his loss on the other was 20%. What was his loss or profit?

4. If Ammonium Nitrate is heated, what would it decompose to? Write a balanced equation for this reaction. State two uses of Ammonium Nitrate.

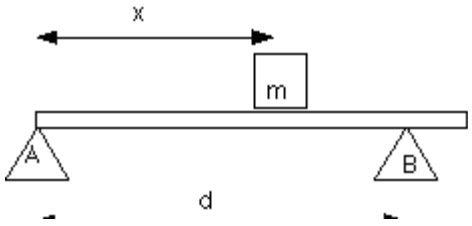
5. What are the 4 points of Kinetic Molecular Theory of Ideal Gases? What two gases behave most like Ideal Gases?

6. What is the molarity of the solution made by dissolving 2.5 g of NaCl in enough water to make 125 ml solution?

7. An object is placed 10 cm in front of a concave mirror of radius of curvature 15 cm. Calculate the position, nature and magnification of the image in each case.

8. A student with a mass of 80 kg runs up three flights of stairs in 12 sec. The student has gone a vertical distance of 8 m. Determine the amount of work done by the student to elevate his body to this height. Assume that his speed is constant.

9. A plank of negligible mass is supported by two supports as shown below.



   a. Draw the forces that act on the plank.
   b. What would happen if x becomes greater than d? Could the arrangement be stable?

10. What is a cookie? Why has this become a privacy concern that prompted the European and the US lawmakers to take action in 2011?