དཔལ་ལྡན་འབྲུག་གཞུང་།
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ROYAL GOVERNMENT OF BHUTAN
ROYAL CIVIL SERVICE COMMISSION

BHUTAN CIVIL SERVICE EXAMINATION 2012
MAIN EXAMINATION
(OCTOBER 13, 2012)

EXAMINATION CATEGORY : TECHNICAL
PAPER II : GENERAL SUBJECT KNOWLEDGE for ENGINEERING GROUP

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

PAPER II: GENERAL SUBJECT KNOWEDGE for ENGINEERING GROUP

Date	: 13 October 2012
Total Marks	: 100
Examination Time	: 90 minutes (1.5 hours)
Reading Time	: 15 minutes (prior to examination time)

READ THE FOLLOWING INSTRUCTIONS CAREFULLY:

- You have 15 minutes (prior to writing time) to read the instructions, clarify doubts, make sure that you have all the pages, and check for any printing errors. DO NOT write during this time.

- This paper consists of **TWO Parts – Part I and Part II. All questions are compulsory.**
  - ✓ **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.

- While answering the multiple choice questions, write only the letter of the correct answer chosen against the question number, clearly and legibly. E.g. 71(c). Any double writing or smudgy answers shall not be evaluated.

- 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 booklets if required.

- Ensure that you write your roll number in the space provided in the answer booklet. In case you take additional answer booklet, make sure that you write your roll number in the additional answer booklet as well.

- This paper has 14 (fourteen) printed pages including this cover 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. E.g. 71(c). Each question carries ONE mark.

SECTION A: Mathematics

1. Diagram used to represent sets:

   a) Bar chart
   b) PERT chart
   c) Venn diagram
   d) Pie chart

2. The ratio of circumference of a circle to its diameter is:

   a) Pi
   b) 2
   c) 0.5
   d) 2 pi

3. A half of sphere is called:

   a) circle
   b) hemisphere
   c) circum-sphere
   d) semicircle

4. Number that has only two factors, one and itself is:

   a) Unique number
   b) Odd number
   c) Prime number
   d) Fraction

5. Find a number which when increased by 17 is equal to 60 times the reciprocal of the number.

   a) 2
   b) 3
   c) 6
   d) 8

6. A man is five times as old as his son, and the sum of the squares of their ages is equal to 2106: find their ages.

   a) Son's age=5 years, father's age=25 years
   b) Son's age=7 years, father's age=35 years
   c) Son's age=9 years, father's age=45 years
   d) Son's age=10 years, father's age=50 years

7. Two numbers are in the ratio of 5:8. If 9 be added to each they are in the ratio of 8:11. Find the numbers

   a) 5,8
   b) 8,11
   c) 15,24
   d) 20,32

8. Find the 5^{th} term of the series 3, 6, 12, ...

   a) 24
   b) 48
   c) 96
   d) 192

9. What would be the total accumulated amount in 5 years if sum of Nu.10,000 is deposited in the bank at an interest rate of 6% per annum compounded monthly?

   a) Nu. 13,488.50
   b) Nu. 13,300.00
   c) Nu. 13,000.00
   d) Nu.13,500.00

10. A man, whose height is 1.5 m, standing 8 m from a lamp-post, observes that his shadow cast by the light is 1.25 m in length. How high is the light?

    a) 10.0 m
    b) 11.1 m
    c) 12.0 m
    d) 9.0 m

11. What is the length of the edge of a cube of which the total surface area is 24 m^2?

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

12. How many solid spheres 6 cm in diameter could be moulded from a solid metal cylinder whose length is 45 cm and diameter 4 cm?

    a) 10
    b) 8
    c) 6
    d) 5

13. The large hand of a clock is 71.12 cm long. How many centimeters does its extremity move in 20 minutes?

    a) 120.00 cm
    b) 148.95 cm
    c) 150.00 cm
    d) 160.00 cm

14. The angle of elevation of the top of a tower is 30°; on walking 100 m nearer, the elevation is found to be 60°; Find the height of the tower?

    a) $40\sqrt{3}$ m
    b) $45\sqrt{3}$ m
    c) $50\sqrt{3}$ m
    d) $55\sqrt{3}$ m

15. A cow is tied to a pole in a meadow with a nylon rope of 10 meter. The total grazing area is:

    a) 314.2 m^2
    b) 62.84 m^2
    c) 100 m^2
    d) 250 m^2

16. The level of sound D in decibels is defined as follows, $D=4\log(I/10^{-8})$, where I is the sound intensity in watts /cm^2. The level in decibels of a sound with intensity $I=10^{-4}$ watts/cm 2. Find D

    a) 16 decibels
    b) 8 decibels
    c) 10 decibels
    d) 4 decibels

17. Which of the following is an identity?

    a) $\cos(2x) = 2\cos(x)$
    b) $\cos(x+y) = \cos(x)+\cos(y)$
    c) $\sin(x-y) = \sin(x)-\sin(y)$
    d) $\sin(2x) = 2\sin(x)\cos(x)$

18. Lim $_{x\to\infty}\left(\frac{x^4+9x^2-11x}{6x^4}\right)$ is equal to:

a) 1/10
b) 1/6
c) 1/4
d) ∞

19. How many 6 letter words can we make using the letters in the word QUALITY without repetitions?

a) 6040
b) 3528
c) 720
d) 5040

20. Partial fraction of $\frac{5x+10}{x(x+5)}$ is:

a) $\frac{5}{2x}+\frac{3}{(x+5)}$
b) $\frac{2}{3x}+\frac{10}{(x+5)}$
c) $\frac{3}{(2x+5)}$
d) $\frac{2}{x}+\frac{3}{(x+5)}$

SECTION B: Chemistry

21. Substances in which the components exist together without combining chemically is called

a) Element
b) Compound
c) Mixture
d) Molecule

22. Atomic mass refers to the

a) Absolute mass of atom
b) Relative mass of atom
c) Mass of element
d) All of the above

23. Which of this element sometimes is considered a non-metal and other times considered a metal primarily depending on its state?

a) Helium
b) Mercury
c) Hydrogen
d) Water

24. In the chemical equation given below, what is the value in place of question mark

$2Al + ? \ F_2 \rightarrow 2AlF_3$

a) 3
b) 4
c) 5
d) 2

25. An instrument used for measuring pressure of a gas is

a) Barometer
b) manometer
c) Thermometer
d) Seismometer

26. In an electrochemical cells, the conventional current always flow opposite to the flow of electrons , that is :

a) From cathode to anode
b) From anode to cathode
c) Both direction
d) None of the above

27. Chemical reactions accompanied by liberation of heat is said to be

a) Endothermic
b) Exothermic
c) Reverse reaction
d) Forward reaction

28. An atom bomb works on the principle of:

a) Uncontrolled fusion reaction
b) Uncontrolled fission reaction
c) Controlled fission reaction
d) Controlled fusion reaction

29. Which of the following conduct electricity?

a) Dry ice
b) Diamond
c) Rubber
d) Copper

30. Which one is incorrect regarding the properties of the noble gas

a) Odorless
b) Colorless
c) Chemically reactive
d) Chemically inert

31. Which of this element is not a noble gas?

a) Bromium
b) Krypton
c) Argon
d) Neon

32. The reaction between metal and acid always gives:

a) Salt and Water
b) Salt and Hydrogen
c) Salt and Oxygen
d) Hydrogen only

33. The organic compounds are characterized by the presence of

a) Carbon atoms
b) Oxygen atoms
c) Chlorine atoms
d) Nitrogen atoms

34. The chemical formula C_6H_6 refers to which hydrocarbons?

a) Methane
b) Benzene
c) Butane
d) Propane

35. When calcium carbonate is heated, one of the products of the reaction is

a) O_2
b) CO_2
c) CO
d) N_2

36. When no heat is allowed to enter or leave the system, the process is called:

a) Isothermal
b) Adiabatic
c) Isobaric
d) Isochoric

37. You can avoid getting scurvy by eating foods rich in vitamin C, such as citrus fruits. Vitamin C is also known as:

a) Carbonic acid
b) Ascorbic acid
c) Citric acid
d) Nitric acid

38. Amino acid is the building block of :

a) Protein
b) Lipid
c) Carbohydrate
d) DNA

39. Which one the following is not radioactive element:

a) Uranium
b) Thorium
c) Radium
d) Strontium

40. The cleansing action of soap is due to:

a) Temperature of water
b) Emulsification of dirt
c) Coagulation of water
d) Neutrality of water

SECTION C: Physics

41. If a particle's position is given by $x=4-12t+3t^2$, where t is in seconds and x is in meters, what is its velocity at $t=1$ second?

a) 6 m/s
b) -6 m/s
c) 12 m/s
d) -12m/s

42. Raindrops fall to Earth from a cloud 1700 m above the Earth's surface. If they were not slowed by air resistance, how fast would the drops be moving when they struck the ground?

a) 182.5 m/s
b) 150.0 m/s
c) 250.0 m/s
d) 120.0 m/s

43. A coin placed on the book began to slide down when the book is tilted at 13° to the horizontal surface. What is the coefficient of static friction between the coin and the book?

a) 0.15
b) 0.20
c) 0.23
d) 0.30

44. A 75 kg man is riding on a 39 kg cart traveling at a speed of 2.3 m/s. He jumps off with zero horizontal speed. What is the resulting change in the speed of the cart?

a) 6.7 m/s
b) 2.3 m/s
c) 5.5 m/s
d) 4.4 m/s

45. A student seated on a stool that can rotate freely about a vertical axis was set into rotation at a modest speed holding two dumbbells in his outstretched hands. While in rotation, if he pull in his arms towards each other, his angular speed will

a) decrease
b) increase
c) remain same
d) none of the above

46. If you are wearing red shirt and stands under the green light, it will appear:

a) Blue
b) Red
c) Yellow
d) Black

47. When a body moves in a circular path, the work done is equal to :

a) Infinity
b) Zero
c) Mass x acceleration
d) None of the above

48. The period of oscillation of the simple pendulum depends on the

a) Mass of the ball
b) Length of the string
c) Mass of ball and length of string both
d) All of the above

49. An aluminum flagpole is 33m high. By how much does its length increase as the temperature increases by İ5°C? Coefficient of linear expansion of aluminum =23x10^{-6}/°C

a) 1.14 mm
b) 11.4 mm
c) 114.0 mm
d) 0.114 mm

50. Ammeter is an instrument used to measure the

a) Potential difference between two points in the circuit
b) Resistance of wire
c) Current in a wire
d) None of the above

51. An electric heater appliance in your home converts:

a) Heat energy to electric energy
b) Electric energy to heat energy
c) Mechanical energy to electric energy
d) Electric energy to Chemical energy

52. Three resistors 6Ω, 10 Ω and 15 Ω are connected in series and a supply voltage of 230 V is applied across it. Calculate the current flowing in the circuit.

a) 7.419 A
b) 0.143 A
c) 10 A
d) 12 A

53. The Cathode Ray Tube is used in which of the following household items?

a) Radio
b) Microwave oven
c) Television
d) Refrigerator

54. If a private radio station transmits its signal at frequency of 90 kHz and the speed of radio waves in air is 3×10^8 m/sec, the wavelength of radio waves will be:

a) 3333.33 m
b) 3333333.33 m
c) 333333.33 m
d) 33333.33 m

55. When a spoon is placed in a beaker of water, it appears broken because of the following phenomenon:

a) Radiation of light
b) Reflection of light
c) Refraction of light
d) Absorption of light

56. A natural phenomenon in which a pool of water that appears to lie on the road some distance ahead of you on a sunny day but which you can never reach is called

a) Image
b) Illusion
c) Mirage
d) Picture

57. Image formed in the rear-view(convex) mirror of the car will be

a) Smaller than the real object
b) Larger than the real object
c) Same as the real object
d) None of the above

58. The infra-red radiation are used for photography in fog because they are:

a) Scattered more by fogs
b) Scattered less by fog
c) Absorbed by fog
d) Reflected by fog

59. If there is a fall in barometric height suddenly , it indicates:

a) Plenty of sunshine
b) Arrival of rain
c) Arrival of storm
d) Arrival of snow

60. The most recognized model for how the universe begun is known as the :

a) Newton model
b) Natural selection model
c) Kepler's planetary model
d) Big Bang model

SECTION D: General IT Knowledge

61. In computer graphics, the ratio between the height and width of image is called:

a) Focus ratio
b) Aspect ratio
c) Resolution ratio
d) None of the above

62. WYSIWYG feature is available in some application programs based on graphical user interfaces. The acronym of WYSIWYG is:

a) What You See Is What You Get
b) What you See Is What You Graph
c) What you Set Is What You Get
d) None of the above

63. Inside the computer, most of the mathematical calculations are carried out by the

a) Processing unit
b) Arithmetic logic unit
c) Internal memory
d) External memory

64. The programming language used to create hypertext documents for the use on world wide web is :

a) HyperText Markup Language(HTML)
b) Hyper Text Transfer Protocol
c) FORTRAN
d) COBOL

65. A group of eight bits is called byte. The number of combinations of 0 and 1 in each byte is:

a) 1^8
b) 10^8
c) 2^8
d) 64

66. It is a computer recognizable code that stores code in black thick and thin parallel lines that represent binary digit. It is usually used for product identification for tracking sales etc. It is known as:

a) Barcode
b) Binary code
c) Line code
d) Digital code

67. 1 Gigabyte is equal to :

a) 1073741824 bytes
b) 1000000000 bytes
c) 102400000 bytes
d) 640000000 bytes

68. The size of program and amount of data that a computer can process at any one time depend on the size of :

a) Read Only Memory
b) Random Access Memory
c) Rapid Access Memory
d) Programmable Read Only Memory

69. The most well-known protocol that that allows a computer to use a standard telephone line and a modem to make a connection to internet:

a) Point-to-Point Protocol
b) Public Switched Telephone Network
c) Serial Line Internet Protocol
d) Point-to-Node Protocol

70. An animation technique in which the image is stretched and squashed:

a) Squashing
b) Editing
c) Warping
d) Stretching

PART II : SHORT ANSWER QUESTIONS

Answer all questions. Each question carries THREE marks.

1. Solve the equation $8^{(5-3x)}=12^{(4-2x)}$ for the value of x, having given log 2=0.30103, and log 3=0.47712

2. Find $\int_0^1 \frac{2x}{\sqrt{x^2+5}}dx$

3. The centre of the circle is at (2, -5) with radius 3. Find the equation of the circle.

4. The radioisotope cobalt-60 is used to destroy cancerous cells by directing γ-rays into the cancerous cell tissue. Calculate the fraction of a cobalt-60 sample left after 20.00 years. The half-life of cobalt-60 is 5.27 years.

5. Write a balanced equation illustrating how Nitric Acid is produced from Ammonia. List down some uses of Nitric Acid.

6. A catfish is 2.00 m below the surface of a smooth lake. What is the diameter of the circle on the surface through which the fish can see the world outside the water? If the fish descends, does the diameter of the circle increase, decrease, or remain the same? Index of refraction of a water=1.33 and air=1.00

7. A block of wood floats in water with two-thirds of its volume submerged. In oil the block floats with 0.90 of its volume submerged. Find the density of (a) the wood and (b) the oil.

8. Assume that the tariff for Transmission and Distribution company for its Low Voltage consumer is as follows:

Block	**kWh/month**	**Energy Charges (Nu./kWh)**
I	0-100	0.80
II	101-300	1.20
III	Above 300	1.85
Fixed charges	Nu. 50/ month	

If the total power drawn by your appliances for this month at your home is say 2 kW and you use it for five hours each day, what will be your electricity bill for this month?

9. What is Clean Development Mechanism (CDM)? Name about three Green House Gases. How can CDM project benefits the developing countries?

10. Draw XOR gate with input A and B and Output X. Give the truth table for XOR gate.