

Farwestern University
Faculty of Engineering
Mahendranagar, Kanchanpur, Nepal
BE Entrance Examination

Full Marks: 150

Time: 3 hours

Attempt all questions:

Read the following questions and write down the correct option **a, b, c, or d** in the answer sheet provided. In section I each question carries **1(one)** mark and in section II each question carries **2 (two)** marks.

Section I (50x1=50)

1. The angle between the vectors $\vec{a} = \vec{i} + \vec{j} + \vec{k}$ and $\vec{b} = \vec{i} - \vec{j} + \vec{k}$ is
(a) $\cos^{-1}(\frac{1}{3})$ (b) $\cos^{-1}(\frac{1}{\sqrt{3}})$ (c) $\cos^{-1}(3)$ (d) $\cos^{-1}(\sqrt{3})$
2. If $\vec{a} = \vec{i} + \vec{j} - \vec{k}$ and $\vec{b} = \vec{i} - \vec{j} + \vec{k}$ then the magnitude of the vector $2\vec{a} + 3\vec{b}$ is
(a) $\sqrt{3}$ (b) 9 (c) 3 (d) $3\sqrt{3}$
3. If $A = \begin{bmatrix} 1 & -1 \\ 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$, Then the matrix AB is equal to
(a) $\begin{bmatrix} -1 & -1 \\ -1 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & -1 \\ 1 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & -1 \\ 1 & 1 \end{bmatrix}$
4. A square matrix A is said to be a singular matrix if
(a) $|A| = 1$ (b) $|A| = 0$ (c) $|A| \neq 1$ (d) $|A| > 1$
5. The value of $i + i^2 + i^3$ is
(a) $2i - 1$ (b) $2i + 1$ (c) -1 (d) 1
6. The product of the roots of the equation $3x^2 - 2x + 1$ is
(a) $\frac{1}{3}$ (b) $-\frac{1}{3}$ (c) $-\frac{2}{3}$ (d) $\frac{2}{3}$
7. If a, b, c are in G.P. then a^k, b^k, c^k are in
(a) A.P. (b) G.P. (c) H.P. (d) A.G.P.
8. In how many ways 8 guests and a host be seated in a circular table
(a) 7! (b) 8! (c) 9! (d) 10!
9. If n is a positive integer, then how many terms are there in the expansion of $(x + a)^n$?
(a) $n - 1$ (b) n (c) $n + 1$ (d) n^2

10. The value of $\frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \dots$ is
 (a) e (b) $e + 1$ (c) $e - 2$ (d) $e - 1$
11. Apparent frequency received by listener when source of sound and listener are approaching each other is....
 (a) $\frac{(v - v_s)}{(v - v_l)} \times f$ (b) $\frac{(v + v_l)}{(v - v_s)} \times f$ (c) $\frac{(v - v_s)}{(v + v_l)} \times f$ (d) $\frac{(v + v_s)}{(v + v_l)} \times f$
12. At same temperature and pressure, velocity of sound is highest in.....
 (a) hydrogen (b) oxygen (c) nitrogen (d) carbon dioxide
13. Expression for lateral shift is.....
 (a) $\frac{t}{\text{Cos}r} \text{Sin}(i - r)$ (b) $\frac{t}{\text{Cos}r} \text{Sin}(i + r)$ (c) $\frac{t}{\text{Cos}r} \text{Sin}(r - i)$ (d) $\frac{t}{\text{Sin}r} \text{Sin}(i - r)$
14. When light travels from air into water.....
 (a) frequency decreases (b) frequency increases
 (c) wavelength increases (d) wavelength decreases
15. When Young's double slit experiment is carried inside water with same geometry, fringe width.....
 (a) increases (b) decreases
 (c) remains same (d) first increases and then decreases
16. At 0°C , kinetic energy of gas molecule is.....
 (a) zero (b) negative (c) positive (d) none of these
17. Two bodies will be in thermal equilibrium when they have same.....
 (a) heat energy (b) specific heat capacity
 (c) temperature (d) thermal conductivity
18. Isobaric process takes place at constant.....
 (a) pressure (b) volume (c) temperature (d) none of these
19. Ideal gas is considered under.....
 (a) high pressure and high temperature
 (b) high pressure and low temperature
 (c) low pressure and low temperature
 (d) low pressure and high temperature
20. Entropy change during adiabatic process is.....
 (a) zero (b) positive (c) negative (d) infinite

21. Hardness of water is due to.....
(a) Sodium bicarbonate (b) Calcium carbonate
(c) Potassium carbonate (d) Magnesium chloride
22. Haber's process is used for the manufacture of
(a) Nitrogen (b) Ammonia (c) Hydrogen (d) Nitric oxide
23. Which of the following is amorphous form of Sulphur?
(a) Rhombic (b) Monoclinic (c) Milk of Sulphur (d) Beta Sulphur
24.changes the starch emulsion into blue-black color
(a) Fluorine (b) Chlorine (c) Bromine (d) Iodine
25. Tincture of iodine is.....
(a) KI (b) KI + I₂ (c) KI + I₂ + C₂H₅OH (d) KI + I₂ + Ti
26. Haematite is an ore of
(a) Iron (b) Copper (c) Silver (d) Magnesium
27. When brine solution is saturated with ammonia in presence of carbon dioxide gas, the resulting products is/are
(a) Ammonium bicarbonate
(b) Sodium bicarbonate
(c) Ammonium bicarbonate or sodium bicarbonate
(d) Ammonium bicarbonate and sodium bicarbonate
28. Steel is an alloy of iron containingpercent of carbon with possibly traces of phosphorus, sulphur, and silicon.
(a) 2 to 4 (b) 0.2 to 2 (c) 0.02 to 0.2 (d) 0.002 to 0.02
29. Blistering of blister copper is due to
(a) Inherent property
(b) Dissolved gas molecules
(c) Escaping of dissolved gas from molten mass
(d) The presence of oxide moieties
30. Which of the following compound shows thermochromic property?
(a) FeO (b) CuO (c) Na₂O (d) ZnO
31. Had she run away, she by police?
(a) won't be caught (b) wouldn't have been caught
(c) wouldn't be caught (d) will be caught
32. Which of the following word has different vowel sound than the rest?
(a) Pear (b) Pair (c) Care (d) Rare

33. Which of the following is true for the word 'Collection'?
- (a) It contains three syllables and the first syllable is stressed.
 - (b) It contains four syllables and the second syllable is stressed
 - (c) It contains three syllables and the second syllable is stressed.
 - (d) It contains four syllables and the last syllable is stressed.
34. My boss visits the officethe morning.
- (a) at
 - (b) on
 - (c) in
 - (d) with
35. I am running outmoney so I could not pay your debt this month.
- (a) up
 - (b) of
 - (c) with
 - (d) in
36. Which of the following is the appropriate adjective pattern?
- (a) attractive new Japanese car
 - (b) new attractive Japanese car
 - (c) Japanese new attractive car
 - (d) attractive Japanese new car
37. No one told me that 's going to be a party.
- (a) it
 - (b) there
 - (c) here
 - (d) where
38. Which of the following is the plural form of word **crisis**?
- (a) crises
 - (b) crisis
 - (c) crises
 - (d) crissises
39. Don't put off making a decision. Which of the formal word can replace the underlined word in the sentence?
- (a) solve
 - (b) calculate
 - (c) organize
 - (d) postpone
40. You should not wake someone up when they're.....walking.
- (a) night
 - (b) dream
 - (c) day
 - (d) sleep
41. I am interested in. I don't want to study it,
- (a) however
 - (b) though
 - (c) although
 - (d) even though
42. Identify the correct order of the determiners in the sentence.
- (a) All our many hopes were kept alive by her encouraging words.
 - (b) Our many all hopes were kept alive by her encouraging words.
 - (c) Many all our hopes were kept alive by her encouraging words.
 - (d) Our all many hopes were kept alive by her encouraging words.
43. Both the China institute and the Brooklyn Museum Asian art.
- (a) are
 - (b) has
 - (c) is
 - (d) have
44. Most people in Argentina Spanish.
- (a) to speak
 - (b) speak
 - (c) speaking
 - (d) speaks

45. Dr. Murray Salby, a well-known climatologist, a paper about the causes of global warming.
 (a) are writing (b) write (c) writes (d) is writing
46. The search engine BackRub.....Google in 1998.
 (a) became (b) becomes (c) become (d) was becoming
47. In his youth he was practically rolling in money. The underlined idiom is closest to the meaning:
 (a) spending more than his income (b) wasting a lot of money
 (c) very rich (d) borrowing money liberally
48. I don't want to stifle your creativity, but your ideas for the brochure are too complicated. Let's try to make it very simple. The underlined word is closest to the meaning:
 (a) to let go of something (b) to prevent something from happening
 (c) to support something strongly (d) to make something clear
49. Which of the following is the correct sentence?
 (a) Rohan I was wondering where, the cookies were.
 (b) Rohan I was wondering where the cookies, were.
 (c) Rohan, I was wondering where the cookies were.
 (d) Rohan I was wondering, where the cookies were.
50. The passive of 'do not waste the time.' is.....
 (a) Let the time be not wasted.
 (b) Let not the time be wasted.
 (c) Let the time not wasted.
 (d) Let the time not be wasted.

Section II (50x2=100)

51. If A and B are two sets having 5 and 17 elements respectively and 2 elements are common. How many elements are there in the set $A \cup B$?
 (a) 3 (b) 15 (c) 20 (d) 12
52. If a function $f(x)$ is defined by $f(x) = \frac{x^2 - |x|}{1 + 2|x|}$ then the value of $f(-1)$ is
 (a) 1 (b) 0 (c) -1 (d) $\frac{2}{3}$
53. If $\sin \theta = 1$. Then the general value of θ are given by
 (a) $n\pi + \frac{\pi}{2}$ (b) $n\pi - \frac{\pi}{2}$ (c) $n\pi$ (d) $n\pi + (-1)^n \frac{\pi}{2}$
54. The value of $\sin^{-1} x + \cos^{-1} x$ is
 (a) 1 (b) π (c) $\frac{\pi}{2}$ (d) 2

55. In any triangle if $\tan A + \tan B + \tan C = 6$ and $\tan A \tan B = 3$. Then the value of $\tan A + \tan B$ is...
- (a) 4 (b) 2 (c) 3 (d) 9
56. If the lines $3x + 4y = 9$ and $4x + ky = 5$ are perpendicular then what will be the value of k ?
- (a) 3 (b) -3 (c) 4 (d) -4
57. The condition for a homogenous equation $ax^2 + 2hxy + by^2 = 0$ to represent a real and coincident lines is
- (a) $h^2 - ab = 0$ (b) $h^2 - ab > 0$ (c) $h^2 - ab < 0$ (d) $h^2 = ab$
58. The centre of the circle $x^2 + y^2 - 2x + 6y + 18 = 0$ is
- (a) (-1,3) (b) (1,3) (c) (-1, -3) (d) (1, -3)
59. If e denotes the eccentricity of the parabola $x^2 - 4x - 8y + 12 = 0$. Then the value of e is.....
- (a) < 1 (b) ∞ (c) 1 (d) > 1
60. If the direction ratios of a line are 4,5,6. Then its direction cosines are
- (a) $\frac{4}{\sqrt{77}}, \frac{5}{\sqrt{77}}, \frac{6}{\sqrt{77}}$ (b) $\frac{4}{\sqrt{77}}, -\frac{5}{\sqrt{77}}, \frac{6}{\sqrt{77}}$ (c) $-\frac{4}{\sqrt{77}}, \frac{5}{\sqrt{77}}, \frac{6}{\sqrt{77}}$ (d) $\frac{4}{\sqrt{77}}, -\frac{5}{\sqrt{77}}, -\frac{6}{\sqrt{77}}$
61. The value of $\lim_{x \rightarrow \infty} x \tan \frac{1}{x}$ is.....
- (a) -1 (b) 0 (c) 1 (d) does not exist
62. The derivative of $\cos^{-1} x$ is.....
- (a) $\frac{1}{\sqrt{1-x^2}}$ (b) $-\frac{1}{\sqrt{x^2-1}}$ (c) $\frac{1}{1-x^2}$ (d) $-\frac{1}{\sqrt{1-x^2}}$
63. The value of $\int_1^e \frac{1}{x} dx$ is
- (a) 1 (b) 0 (c) -1 (d) 2
64. If the function $f(x) = 4x^2 + 2x + 3$ has a local minima at x_0 then the value of x_0 is
- (a) $\frac{1}{4}$ (b) $-\frac{1}{4}$ (c) $\frac{1}{2}$ (d) $-\frac{1}{2}$
65. The area bounded by the lines $y = x$, $x = 1$ and the x axis is
- (a) 1 (b) 2 (c) $\frac{1}{2}$ (d) $\frac{1}{4}$
66. If velocity, force and time are taken as fundamental units then dimensional formula of mass is.....
- (a) $[FT]$ (b) $[FTV^{-1}]$ (c) $[FTV]$ (d) $[FTV^{-2}]$
67. Angle between $\vec{A} = (3\hat{i} + 4\hat{j} - 5\hat{k})$ and $\vec{B} = (3\hat{i} + 4\hat{j} - 5\hat{k})$ is.....
- (a) 0^0 (b) 30^0 (c) 60^0 (d) 90^0

68. A lift with mass 1500kg supported by string is moving upward with acceleration 1.8ms^{-2} . The tension in the string is...
- (a) 1770N (b) 17700N (c) 15000N (d) 16000N
69. If angular velocity of earth increases then value of g at poles.....
- (a) increases (b) decreases (c) remains same (d) none of these
70. Time period T of simple pendulum inside lift moving upward with acceleration $g/2$ becomes...
- (a) $\frac{\sqrt{3}}{2}T$ (b) $\frac{\sqrt{3}}{4}T$ (c) $\frac{\sqrt{3}T}{6}$ (d) $\sqrt{\frac{2}{3}}T$
71. Young's modulus for perfectly plastic body is...
- (a) 0 (b) 1 (c) ∞ (d) some finite value
72. An ice berg of density 0.92g/cc is floating in water of density 1.03g/cc . The percentage volume of iceberg outside water is....
- (a) 11% (b) 72% (c) 79% (d) 89%
73. Ratio of specific charge of electron to that of beta-particle is....
- (a) 1:3 (b) 1:1 (c) 2:1 (d) 4:1
74. The ratio of frequency of electron in third orbit to second orbit is...
- (a) 2:3 (b) 4:5 (c) 4:9 (d) 6:5
75. Nuclear density increases with.....
- (a) increase in mass number (b) increase in atomic number
(c) increase in number of proton (d) none of these
76. A radioactive element has half -life 15 years. The fraction will decayed in 30 years is....
- (a) 1:2 (b) 2:3 (c) 3:4 (d) 4:5
77. Discharging equation of capacitor is.....
- (a) $q = q_0 e^{\frac{t}{RC}}$ (b) $q = q_0 e^{-\frac{t}{RC}}$ (c) $q = q_0 e^{\frac{-tC}{R}}$ (d) $q = q_0 e^{\frac{-tR}{C}}$
78. Vector form of Biot-Savart law is...
- (a) $d\vec{B} = \frac{\mu_0 I (d\vec{l} \times \vec{r})}{4\pi r^3}$ (b) $d\vec{B} = \frac{\mu_0 I (\vec{r} \times d\vec{l})}{4\pi r^3}$
(c) $d\vec{B} = \frac{\mu_0 I (\vec{r} \times d\vec{l})}{4\pi r^2}$ (d) $d\vec{B} = \frac{\mu_0 I (d\vec{l} \times \vec{r})}{4\pi r^2}$

79. When two bulbs rated 40w, 220v and 60w, 220v are connected in parallel with 220v supply,.....
- 40w will glow brighter than 60w bulb
 - 60w will glow brighter than 40w bulb
 - both bulbs glow equally brighter
 - both bulbs burn out
80. Peak and r.m.s. value of A.C. are related as....
- $I_{r.m.s.} = 70.7\%I_0$
 - $I_{r.m.s.} = 63.7\%I_0$
 - $I_{r.m.s.} = 67.7\%I_0$
 - $I_{r.m.s.} = 67.3\%I_0$
81. Chloride of a metal 'M' is MCl_4 . The salt of the metal when treated with concentrated nitric acid is....
- M_3N_4
 - M_3NO_3
 - M_4NO_3
 - $M(NO_3)_4$
82. Which of the following set of quantum number designation (in the order of n, l, m, s) is incorrectly expressed?
- 4, 2, 1, +1/2
 - 4, 2, 1, -1/2
 - 4, 2, 1, 0
 - 4, 3, 1, +1/2
83. Which of the following compound has exact numbers of valence electrons as much as demanded by octet rules?
- $AlCl_3$
 - $SiCl_4$
 - PCl_5
 - SF_6
84. Complete reduction of one mole permanganate ions in acidic medium is possible bymole of electrons .
- 5
 - 3
 - 2
 - 1
85. The number of atoms present in 0.1 mol of water is...
- 3
 - 0.3
 - $0.3N_A$
 - $0.1N_A$
86. 4 gram of a metal displaces 10.8 g of silver from silver nitrate solution. The equivalent weight of the metal is
- 108
 - 40
 - 4
 - 10.8
87. 5A current was passed into a voltameter containing copper sulphate solution for 15 minutes. Assuming 50% efficacy of the process, the amount of copper deposited during the process is....
- 1.480 g
 - 0.740 g
 - 0.370 g
 - 2.960 g
88. Solubility of calcium carbonate is 3.049×10^{-4} . What is the solubility product of that salt?
- 9.3×10^{-8}
 - 3.049×10^{-4}
 - 3.049×10^{-2}
 - 3.049×10^{-16}
89. What is the mass of calcium carbonate required to neutralize 40 mL of seminormal HCl solution?
- 8 g
 - 4 g
 - 2g
 - 1 g

90. 10 mL of decinormal ammonium hydroxide was mixed with 20 mL of 0.05M hydrochloric acid. The pH of the resulting solution after mixing is...
- (a) 7 (b) Less than 7 (c) More than 7 (d) Amphoteric
91. Pyrrole consists of as a heteroatom
- (a) N (b) S (c) O (d) P
92. Functional group of ester and acid chloride are.....respectively.
- (a) HCOOR and RCOCl (b) $-C=O$ and $-COCl$ (c) $-CO_2$ and $-CO$ (d) $-CO_2-$ and $-COCl$
93. Which of the following pair of organic compounds show functional isomerism?
- (a) Alcohol and aldehyde (b) Alcohol and ether
(c) Ether and aldehyde (d) Aldehyde and ester
94.are more likely to be obtained on heating a product formed upon introducing streams of ozone into an alkene solution in organic medium.
- (a) Aldehyde (b) Ketone (c) Aldehyde and ketone (d) Aldehyde or ketone or mixture of both
95. Sodium benzoate upon heating in presence of sodalime gives.... as a major product.
- (a) Benzene (b) Toluene (c) Benzoic acid (d) azobenzene

Read the passage carefully and answer the questions that follow (for Q.N. 96-100)

It is estimated that over one million people volunteer overseas each year. Many of these volunteers travel thousands of miles to other countries all across Africa, Asia, and Latin America. They experience foreign cultures and visit beautiful places. However, volunteering in a foreign country is not just for the fun of international travel. In fact, people volunteer overseas for several important reasons.

One of the main reasons people volunteer overseas is to give back to those in need. For example, many volunteers travel to poorer countries where people don't have basic conveniences that are found in other countries. Some build wells to give small villages access to clean water. Others set up medical clinics so people can get treatment for common illnesses like the flu. Many of these volunteers come from countries with good schools and they want to give others the same educational opportunities. Overall, these volunteers feel they have a responsibility to people who deserve the same opportunities they have back home.

Second of all, many volunteers feel that travelling overseas can improve their job skills. These volunteers can add their international experiences to their resumes. This is important because many companies today are looking for employees who have a global perspective. Volunteering overseas also teaches people how to work effectively on a team, which helps when applying for future jobs. Learning about teamwork in a foreign setting will make these volunteers stand out from the crowd when they apply for jobs.

A third reason people volunteer in foreign countries is because they want to immerse themselves in a foreign culture. Living in another country is one of the most rewarding experiences a person can have. Being a part of a new culture for even a short period of time will bring these volunteers a sense of belonging and a deeper level of understanding of how people live on other parts of the world.

In addition to experiencing the new country volunteers also get time away from their modern, fast paced lifestyles back home. The majority of volunteers come from Canada, the United States and the United Kingdom, where people are often rushing around the feeling stressed. When these volunteers spend time in a country with a slower pace of life, they feel less stress and can enjoy a different life style. This shows that volunteering abroad can be good for both the mind and the body.

Overseas volunteers don't just travel for fun. They travel with a purpose. All these volunteers travel because they want to help others in some way. At the same time, they are gaining valuable work and life experiences. It's hard to ask for anything more than that.

- 96.** Many volunteers travel to poorer countries so that
- (a) they could know how people work.
 - (b) they can work with minimum facilities like them.
 - (c) they can provide some assistance to them.
 - (d) they can learn survival skills.
- 97.** Which of the following is not associated with contributing to improving the job skills of the volunteers?
- (a) It adds skills to their CV.
 - (b) It increases their teamwork spirit.
 - (c) It makes them aware about the global perspective.
 - (d) It helps them learn the foreign culture.
- 98.** The word 'conveniences' in the second paragraph is closest to the meaning:
- (a) amenities
 - (b) ease
 - (c) communicable
 - (d) transportable
- 99.** The phrasal verb 'stand out' in the third paragraph can be replaced by
- (a) to be effective
 - (b) to be much better than others
 - (c) to show
 - (d) to prove
- 100.** How is volunteering good for mind and body according to the passage?
- (a) It helps them to learn new culture.
 - (b) It improves their job skills.
 - (c) They help people in need.
 - (d) It keeps them in slower pace of life.