**Time: 2 Hours 30 Minutes**

**Instructions:**

**1. Every Questions carries two marks.**

**2. Paper (BE-01) and Paper (BE-02) carries 100 marks each.**

## Section: 01
## Basics of Science and Engineering (BE-01)

| Q. No. | Question | | | |
|---|---|---|---|---|
| 1 | Number of Significant digits in 1.007 is_____ | | | |
| | A | 1 | B | 2 |
| | C | 3 | D | 4 |
| 2 | Which of the following is a fundamental quantity? | | | |
| | A | Speed | B | Momentum |
| | C | Acceleration | D | Length |
| 3 | What is the least count of a micrometer screw having 1mm pitch and 100 divisions on its circular scale? | | | |
| | A | 0.1mm | B | 0.01mm |
| | C | 1mm | D | 0.001mm |
| 4 | 1 Joule =_____erg | | | |
| | A | $10^{-5}$ erg | B | $10^{-7}$ erg |
| | C | $10^{-11}$ erg | D | $10^{7}$erg |
| 5 | The main scale of the vernier callipers is calibrated in millimeter. There are 20 divisions on the vernier scale. Find out the least count of the instrument. | | | |
| | A | 0.5 mm | B | 0.05 mm |
| | C | 5 mm | D | 0.005 mm |
| 6 | SI Unit of Electric potential is..... | | | |
| | A | Coulomb | B | Ampere |
| | C | Ohm | D | Volt |
| 7 | Which law does give magnitude of force between two static electric charges? | | | |
| | A | Coulomb's law | B | Ohm's law |
| | C | Faraday's law | D | Newton's law |
| 8 | According to Ohm's law V = …..... | | | |
| | A | I/R | B | PR |
| | C | IR | D | $I^2R$ |
| 9 | What is unit of Resistance? | | | |
| | A | Ohm | B | Volt |
| | C | Ampere | D | Watt |
| 10 | In a _____ circuit, the total resistance is greater than the largest resistance in the circuit. | | | |
| | A | Parallel | B | Series |
| | C | Either series or parallel | D | Neither series nor parallel |
| 11 | Equivalent resistance for parallel connection = …..... | | | |
| | A | 1/ Req. = ( 1 / $R_1$ ) + ( 1 / $R_2$ ) | B | $R_{eq} = R_1 + R_2$ |
| | C | $R_{eq} = R_1 \times R_2$ | D | 1/ Req. = $R_1 + R_2$ |
| 12 | Unit of Electrical Conductivity is……. | | | |
| | A | Ohm | B | mho |
| | C | Watt | D | Ohm-meter |
| 13 | What is the frequency of wave with a wavelength of 12 cm? | | | |

| | | | | |
|---|---|---|---|---|
| | A | 2.5 GHz | B | 2.4 GHz |
| | C | 2.5 MHz | D | 2.5 KHz |
| 14 | What is the wavelength of wave with a frequency of 150 MHz? | | | |
| | A | 2 m | B | 2 cm |
| | C | 20 m | D | 20 cm |
| 15 | The Snell's law is given by | | | |
| | A | $N_2 \sin \theta i = N_1 \sin \theta r$ | B | $N_1 \cos \theta i = N_2 \cos \theta r$ |
| | C | $\sin \theta i = \sin \theta r$ | D | $N_1 \sin \theta i = N_2 \sin \theta r$ |
| 16 | The change in the direction of a wave passing from one medium to another is termed as…….. | | | |
| | A | Diffraction | B | Interference |
| | C | Refraction | D | Scaterring |
| 17 | The property of a conductor due to which it passes current is called ……. | | | |
| | A | Resistivity | B | Conductivity |
| | C | Resisitance | D | Conductance |
| 18 | A wire of length 2 m and another wire of length 5 m are made up of the same material and have the same area of cross section, which wire has higher resistance? | | | |
| | A | Both have equal resistance | B | The 2 m wire has higher resistance |
| | C | The 5 m wire has higher resistance | D | The value of resistance cannot be determined from the given data |
| 19 | Heat can travel from one end to another in a copper rod due to……. | | | |
| | A | Heat radiation | B | Heat convection |
| | C | None of given | D | Heat conduction |
| 20 | Temperature of boiling water is _____ $^0$F | | | |
| | A | 373 | B | 212 |
| | C | 100 | D | 312 |
| 21 | By which of the following ways energy of sun reaches to earth? | | | |
| | A | Conduction | B | Convection |
| | C | Radiation | D | All of given |
| 22 | 101 $^0$F = _____ $^0$C | | | |
| | A | 38.20$^0$C | B | 36.33$^0$C |
| | C | 32.33$^0$C | D | 38.33$^0$C |
| 23 | _____ is a property of a material that describes its ability to conduct heat. | | | |
| | A | Thermal conductivity | B | Specific heat |
| | C | Heat capacity | D | Emissivity |
| 24 | Unit of heat capacity is…… | | | |
| | A | $^0$C / Cal | B | Cal |
| | C | Cal / $^0$C | D | Kelvin |
| 25 | Which Newton law gives the value of force? | | | |
| | A | First | B | Third |
| | C | Second | D | None of the above |
| 26 | 1N = _____dyne | | | |
| | A | $10^{-5}$ | B | $10^{-7}$ |
| | C | $10^5$ | D | $10^7$ |
| 27 | The product of mass and velocity is called…… | | | |
| | A | Density | B | Momentum |
| | C | Force | D | Acceleration |
| 28 | What is the unit of impulse of force? | | | |
| | A | N m | B | kg m |
| | C | kg s | D | N s |
| 29 | Which force is responsible for keeping an object moving in a circular path? | | | |
| | A | Centripetal force | B | Gravitational force |

| | | | | |
|---|---|---|---|---|
| | C | Centrifugal force | D | Frictional force |
| 30 | What type of energy does an object in motion possess? | | | |
| | A | Gravitational potential energy | B | Elastic potential energy |
| | C | Kinetic energy | D | Chemical energy |
| 31 | Magnesium ribbon is rubbed before burning because it has a coating of | | | |
| | A | basic magnesium carbonate | B | basic magnesium oxide |
| | C | basic magnesium sulphide | D | basic magnesium chloride |
| 32 | Which one of the following salts does not contain water of crystallisation? | | | |
| | A | Blue vitriol | B | Baking soda |
| | C | Washing soda | D | Gypsum |
| 33 | Oxidation is a process which involves | | | |
| | A | addition of oxygen | B | addition of hydrogen |
| | C | removal of oxygen | D | removal of hydrogen |
| 34 | In terms of acidic strength, which one of the following is in the correct increasing order? | | | |
| | A | Water < Acetic acid < Hydrochloric acid | B | Water < Hydrochloric acid < Acetic acid |
| | C | Acetic acid < Water < Hydrochloric acid | D | Hydrochloric acid < Water < Acetic acid |
| 35 | Give the ratio in which hydrogen and oxygen are present in water by volume. | | | |
| | A | 1:2 | B | 1:1 |
| | C | 2:1 | D | 1:8 |
| 36 | What is formed when zinc reacts with sodium hydroxide? | | | |
| | A | Zinc hydroxide and sodium | B | Sodium zincate and hydrogen gas |
| | C | Sodium zinc-oxide and hydrogen gas | D | Sodium zincate and water |
| 37 | $MnO_2 + 4HCl \rightarrow {}_2 + 2H_2O + Cl_2$ | | | |
| | A | $MnCl_2$ | B | HCl |
| | C | $H_2O$ | D | $MnO_2$ |
| 38 | Tomato is a natural source of which acid? | | | |
| | A | Acetic acid | B | Citric acid |
| | C | Tartaric acid | D | Oxalic acid |
| 39 | The most abundant metal in the earth's crust is | | | |
| | A | Iron | B | Aluminium |
| | C | Calcium | D | Sodium |
| 40 | Which property of metals is used for making bells and strings of musical instruments like Sitar and Violin? | | | |
| | A | Sonorousness | B | Malleability |
| | C | Ductility | D | Conductivity |
| 41 | Ecosystem made by interaction of Biotic components and _____ | | | |
| | A | Abiotic | B | Lithosphere |
| | C | Lithosphere | D | Atmosphere |
| 42 | Atmosphere is made of _____ | | | |
| | A | All living things | B | All water Bodies |
| | C | Mixture of different gases | D | All geographical features |
| 43 | How many layers included into the Atmosphere? | | | |
| | A | 3 | B | 4 |
| | C | 5 | D | 2 |
| 44 | Producers produce food by _____ in the presence of sun light? | | | |
| | A | Oxidation | B | Recycling |
| | C | Photosynthesis | D | Ammonification |
| 45 | Global warming is represented by _____ | | | |
| | A | Space station | B | Wooden house |
| | C | Igloo | D | Green House effect |
| 46 | Substance that causes pollution is called _____ | | | |

| | | | | |
|---|---|---|---|---|
| | A | Fuels | B | Pollutants |
| | C | Bacteria | D | Antimatter |
| 47 | The light energy supply to solar cell in the form of _____ | | | |
| | A | Photons | B | Electrons |
| | C | Neutrons | D | Carbon |
| 48 | The temperature increases in deep below ground level because of which energy? | | | |
| | A | Nuclear energy | B | Solar energy |
| | C | Wind energy | D | Geothermal energy |
| 49 | In which energy the organic waste is decomposed? | | | |
| | A | Fossil fuel energy | B | Biogas energy |
| | C | Ocean energy | D | Potential energy |
| 50 | PV effect in solar cell converts the solar energy into _____ | | | |
| | A | Mechanical energy | B | Thermal energy |
| | C | Electrical energy | D | Hydraulic energy |

**Section: 02**
**Aptitude Test (Mathematics & Soft Skill) (BE-02)**

| | | | | |
|---|---|---|---|---|
| 1 | $\begin{vmatrix} 2 & -3 \\ 5 & 4 \end{vmatrix}$ =_____ | | | |
| | A | 23 | B | -23 |
| | C | 7 | D | -7 |
| 2 | Order of $\begin{bmatrix} 2 & 3 \\ 3 & 2 \end{bmatrix}$ is _____ | | | |
| | A | $3\times 2$ | B | $3\times 3$ |
| | C | $2 \times 2$ | D | $2 \times 3$ |
| 3 | If A=$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then $A^T =$ _____ | | | |
| | A | $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ | B | $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$ |
| | C | $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ | D | $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ |
| 4 | If A $= \begin{bmatrix} 1 & -2 \\ 2 & -1 \end{bmatrix}$ , then adj A =_____ | | | |
| | A | $\begin{bmatrix} -1 & -2 \\ 2 & 1 \end{bmatrix}$ | B | $\begin{bmatrix} -1 & -2 \\ 2 & -1 \end{bmatrix}$ |
| | C | $\begin{bmatrix} -1 & 2 \\ -2 & 1 \end{bmatrix}$ | D | $\begin{bmatrix} -1 & -2 \\ -2 & 1 \end{bmatrix}$ |
| 5 | Period of $\cos(2x + 7)$ is -------- | | | |
| | A | $2\pi$ | B | $2\pi + 7$ |
| | C | $\pi$ | D | $4\pi$ |
| 6 | $sin^2 42^\circ + cos^2 42° =$ _____. | | | |
| | A | 0 | A | 1 |
| | C | 2 | C | 3 |
| 7 | $tan(\pi + \theta) =$ _____. | | | |
| | A | $tan\theta$ | B | $-tan\theta$ |
| | C | $cot\theta$ | D | $-cot\theta$ |

| | | | | |
|---|---|---|---|---|
| 8 | $i \cdot i =$……. | | | |
| | A | 0 | A | 1 |
| | C | 2 | C | None of these |
| 9 | If $\bar{x} = i + 2j + k$ , then $\lvert\bar{x}\rvert =$…… | | | |
| | A | 1 | B | 6 |
| | C | $\sqrt{2}$ | D | $\sqrt{6}$ |
| 10 | X – intercept of line $2x + 3y - 4 = 0$ is _____ | | | |
| | A | $\frac{-1}{2}$ | B | $\frac{1}{2}$ |
| | C | -2 | D | 2 |
| 11 | Radius of the circle $x^2 + y^2 = 25$ is _____ | | | |
| | A | -5 | B | 5 |
| | C | $\pm 5$ | D | None of these |
| 12 | $\lim_{x \to 0} \frac{5^x - 1}{x}$ = …….. | | | |
| | A | $\log_e 5$ | B | 1 |
| | C | 0 | D | $\log_5 e$ |
| 13 | $\lim_{x \to 2} \frac{x^5 - 32}{x - 2}$ = …….. | | | |
| | A | 1 | A | 16 |
| | C | 18 | C | 80 |
| 14 | If $f(x) = x^2 - 3x + 2,\ then\ f\ (1)$ = ……. | | | |
| | A | 6 | B | 0 |
| | C | 1 | D | 4 |
| 15 | $\frac{\mathrm{d}}{\mathrm{dx}}(\mathrm{x}^{\mathrm{x}}) =$ _____ | | | |
| | A | $\mathrm{x} - \log \mathrm{x}$ | B | $\mathrm{x} + \log \mathrm{x}$ |
| | C | $\mathrm{x}^{\mathrm{x}}(1 + \log \mathrm{x})$ | D | $\mathrm{x} \cdot \mathrm{x}^{\mathrm{x}-1}$ |
| 16 | $\frac{d}{dx}(e^{2x+5}) =$ _____ | | | |
| | A | $e^{2x+5}$ | B | $2e^{2x+5}$ |
| | C | $e^{2x}$ | D | $2xe^{2x+5}$ |
| 17 | The equation of motion of a particle is $S(t) = t^3 - 5t^2 + 3t + 5$. Then the acceleration of the particle at t=1 second is _____$cm/sec^2$ | | | |
| | A | 6 | B | 4 |
| | C | $-4$ | D | $-6$ |
| 18 | $If\ x + y = xy\ , then\ \frac{dy}{dx} =$ ___ | | | |
| | A | $\frac{y+1}{1+x}$ | B | $\frac{y-1}{1-x}$ |
| | C | $\frac{1-y}{1-x}$ | D | $\frac{y+1}{1-x}$ |
| 19 | $\int \frac{1}{x}$ dx =_____ + C | | | |
| | A | $log\lvert x\rvert$ | B | $-\log x$ |

| | | | | |
|---|---|---|---|---|
| | C | $\frac{-1}{x^2}$ | D | $\frac{1}{x^2}$ |
| 20 | $\int x^4$ dx =_____ + C | | | |
| | A | $\frac{x^5}{5}$ | B | $4x^3$ |
| | C | $\frac{x^3}{3}$ | D | $4 \log x$ |
| 21 | $\int \frac{1}{1+x^2}$ dx =_____ + C | | | |
| | A | $\sin^{-1} x$ | B | $\cos^{-1} x$ |
| | C | $\tan^{-1} x$ | D | $\cot^{-1} x$ |
| 22 | $\int x \cdot e^x \, dx = \cdots + c$ | | | |
| | A | $e^x (x-1)$ | B | $e^x(x+1)$ |
| | C | $-e^x(x+1)$ | D | $-e^x(x-1)$ |
| 23 | $\log_2 8$ = _____ | | | |
| | A | 4 | B | 3 |
| | C | 16 | D | 8 |
| 24 | $\log_{15} 1$ = _____ | | | |
| | A | 1 | B | 0 |
| | C | 15 | D | Not Defined |
| 25 | For the data 12,11,14,13,15 mean is _____. | | | |
| | A | 11 | B | 12 |
| | C | 62 | D | 13 |
| | **Read the following passage carefully and answer the questions: (26-30)**<br>Winter is cold in some places. Many plants do not grow during winter. Some plants die. Snow and ice may cover the ground. It can be hard for animals to find food during winter. Animals get through this time in many ways. Birds and butterflies can fly. Many of them do not stick around for the winter. They leave. They go to a place with nice weather. Then they come home in the spring. We call this migration. Migrating is a good way to avoid the cold. Another good way to avoid the cold is to sleep through it. Many animals hide during the winter. Their bodies slow down. They save their energy. They do not eat. They live off of their fat. They do this until food returns. We call this hibernation. Snakes, frogs, and bears hibernate. Some animals store food in their homes. They do not sleep all winter, but they do much less. They live on what they saved in the summer and fall. This is what squirrels, beavers, and raccoons do. Skunks do this too. Other animals tough it out. They do not leave. They do not hide. They must survive. Sometimes nature helps them out. Some animals grow thicker coats in the winter. Other animals change colour. The arctic fox is brown in the summer. His coat turns white in the winter. Winter may be pretty. It is nice to see snow on the trees. But it is dangerous too. People are also at risk. You can get frost bitten or worse. How do you beat the winter? Do you wear a thick coat? Do you stay inside? Or do you live somewhere warm? | | | |
| 26 | Which of these animals migrates during the winter? | | | |
| | A | foxes | B | snakes |
| | C | bears | D | butterflies |
| 27 | Why is winter a difficult season in some places? | | | |
| | A | There is less food. | B | It is colder. |
| | C | Snow and ice cover the ground. | D | All of these |
| 28 | Which of these animals survive winter by eating stored food? | | | |
| | A | bears | B | raccoons |
| | C | frogs | D | birds |

| | | | | |
|---|---|---|---|---|
| 29 | What does it mean to migrate? | | | |
| | A | To grow a thicker coat | B | To move somewhere warmer for a season |
| | C | To enter a long sleep and survive off of body fat | D | To change colours |
| 30 | Which title would best describe this text? | | | |
| | A | Winter: A Time to Migrate | B | Hibernation: Sleeping it off |
| | C | Survive: How Animals Beat the Winter | D | Birds and Butterflies: Nature's Movers and Shakers |
| 31 | The message may be misinterpreted because of _____. | | | |
| | A | barriers | B | distraction |
| | C | depression | D | diversification |
| 32 | A circular is a form of _____ communication. | | | |
| | A | oral | B | Written |
| | C | visual | D | Face to face |
| 33 | Communication through newspapers and television are known as _____. | | | |
| | A | Group communication | B | Interpersonal communication |
| | C | Mass communication | D | none of these |
| 34 | The communication cycle does not include _____. | | | |
| | A | sender | B | message |
| | C | receiver | D | programming |
| 35 | Pointing finger to something is an example of _____. | | | |
| | A | expression | B | gesture |
| | C | body-language | D | para-language |
| 36 | In a letter where is ‘enclosure’ | | | |
| | A | At first | B | Everywhere |
| | C | At last | D | In middle |
| 37 | The correct salutation is _____ | | | |
| | A | Dear Sir, | B | dear Sir, |
| | C | Dear Sir | D | Dear sir, |
| 38 | What strengthens the letter? | | | |
| | A | A good date | B | A good signature |
| | C | Good references | D | A good salutation |
| 39 | The ideal letter has _____ paragraphs. | | | |
| | A | two | B | many |
| | C | three | D | four |
| 40 | The _____ has to be there in the letter. | | | |
| | A | signature | B | reference |
| | C | enclosure | D | date |
| 41 | Listen, what the teacher _____. | | | |
| | A | teaching | B | is teaching |
| | C | teach | D | teaches |
| 42 | Time and Tide _____ for no man. | | | |
| | A | wait | B | waits |

| | | | | |
|---|---|---|---|---|
| | C | waiting | D | are waiting |
| 43 | Mr Mehta ____ in this office since 2010. | | | |
| | A | Has worked | B | Has been working |
| | C | Had worked | D | Worked |
| 44 | Each of the boxes_____ twenty kilograms | | | |
| | A | Weigh | B | Will weigh |
| | C | Weighs | D | Can weigh |
| 45 | The number of tigers _____ decreasing in India. | | | |
| | A | Are | B | Is |
| | C | Have | D | Has |
| 46 | Ashok along with his friends ____ going on the picnic. | | | |
| | A | Are | B | Is |
| | C | Did | D | Were |
| 47 | Find out the correct speeling. | | | |
| | A | Apprentice | B | Apprintice |
| | C | Aprentice | D | Apprentece |
| 48 | Find out the correct speeling. | | | |
| | A | Accommodate | B | Eccomodate |
| | C | Acommodate | D | Ecomodate |
| 49 | “Indians are thin-skinned people.” Here, ‘thin-skinned’ means ____. | | | |
| | A | sensitive | B | practical |
| | C | open-minded | D | conservative |
| 50 | Vigil means? | | | |
| | A | looseness | B | shocked |
| | C | wakefulness | D | victim |