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First Semester B.E. Degree Examination, July/August 2021
Calculus and Linear Algebra

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions.*

1 a. With usual notations prove that $\tan\phi = r\dfrac{d\theta}{dr}$.   **(06 Marks)**

   b. Find the radius of curvature at the point $\left(\dfrac{3a}{2}, \dfrac{3a}{2}\right)$ for the curve $x^3 + y^3 = 3axy$.   **(06 Marks)**

   c. Show that the evolute of the parabola $y^2 = 4ax$ is $27ay^2 = 4(x-2a)^3$.   **(08 Marks)**

2 a. Find the pedal equation of $r = a(1 + \cos\theta)$.   **(06 Marks)**

   b. Show that for the curve $r^2 = a^2\cos 2\theta$ the radius of curvature $\rho = \dfrac{a^2}{3r}$.   **(06 Marks)**

   c. Find the angle between the curves $r = a\log\theta$ and $r = \dfrac{a}{\log\theta}$.   **(08 Marks)**

3 a. Using Maclaurin's series prove that $\sqrt{1+\sin 2x} = 1 + x - \dfrac{x^2}{2} - \dfrac{x^3}{6} + \dfrac{x^4}{24} + \ldots$ **(06 Marks)**

   b. Evaluate   i) $\displaystyle\lim_{x \to 0}\left(\dfrac{a^x + b^x + c^x + d^x}{4}\right)^{1/x}$ ii) $\displaystyle\lim_{x \to 0}(\cos x)^{\frac{1}{x^2}}$ **(07 Marks)**

   c. Show that the function $xy(a - x - y)$ is maximum at $\left(\dfrac{a}{3}, \dfrac{a}{3}\right)$. Hence find maximum value if $a > 0$.   **(07 Marks)**

4 a. If $U = f(x-y, y-z, z-x)$ show that $\dfrac{\partial U}{\partial x} + \dfrac{\partial U}{\partial y} + \dfrac{\partial U}{\partial z} = 0$.   **(06 Marks)**

   b. If x, y, z are the angles of triangle find the maximum value of $\sin x \sin y \sin z$.   **(07 Marks)**

   c. Find $\dfrac{\partial(u, v, w)}{\partial(x, y, z)}$ where $U = x^2 + y^2 + z^2$, $V = xy + yz + zx$ and $W = x + y + z$.   **(07 Marks)**

5 a. Evaluate $\displaystyle\int_{-c}^{c}\int_{-b}^{b}\int_{-a}^{a}(x^2 + y^2 + z^2)\,dx\,dy\,dz$ **(06 Marks)**

   b. Find the area enclosed by the parabolas $y^2 = 4ax$ and $x^2 = 4ay$.   **(07 Marks)**

   c. Prove that $\displaystyle\int_{0}^{\pi/2}\sqrt{\sin\theta}\,d\theta \cdot \int_{0}^{\pi/2}\dfrac{d\theta}{\sqrt{\sin\theta}} = \pi$ **(07 Marks)**

6 a. Change the order of integration and evaluate $\int\limits_{0}^{\infty}\int\limits_{x}^{\infty}\frac{e^{-y}}{y}\,dy\,dx$. (06 Marks)

b. Find the volume of the solid bounded by the planes $x = 0, y = 0, z = 0$ $x + y + z = 1$. (07 Marks)

c. Derive the relation between Beta and Gamma function as $B(m,n) = \dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. (07 Marks)

7 a. A body in air at 25°C cools from 100°C to 75°C in 1 minute. Find the temperature of the body at the end of 3 minutes. (06 Marks)

b. Find the orthogonal trajectory of $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2 + \lambda} = 1$, λ is parameter. (07 Marks)

c. Solve $(x^2 + y^2 + x)dx + xydy = 0$. (07 Marks)

8 a. Solve the L-R circuit $L\dfrac{dI}{dt} + RI = E$ Initially $I = 0$ when $t = 0$. (06 Marks)

b. Solve $\dfrac{dy}{dx} + y\tan x = y^3 \sec x$. (07 Marks)

c. Solve $yp^2 + (x - y)\,p - x = 0$. (07 Marks)

9 a. Find the rank of the matrix
$$\begin{pmatrix} 3 & -4 & -1 & 2 \\ 1 & 7 & 3 & 1 \\ 5 & -2 & 5 & 4 \\ 9 & -3 & 7 & 7 \end{pmatrix}$$
by applying elementary row operations. (06 Marks)

b. Find the largest eigen value and the corresponding eigen vector for $A = \begin{pmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{pmatrix}$
with initial vector $(1\ 1\ 1)^T$ [carryout 5 iterations]. (07 Marks)

c. Investigate the values of λ and μ such that the system of equations $x + y + z = 6$, $x + 2y + 3z = 10$, $x + 2y + \lambda z = \mu$ may have i) Unique solution   ii) Infinite solution iii) No solution. (07 Marks)

10 a. Solve the following system of equation $x + y + z = 9$, $x - 2y + 3z = 8$, $2x + y - z = 3$ by Gauss elimination method. (06 Marks)

b. Reduce the matrix $\begin{pmatrix} -1 & 3 \\ -2 & 4 \end{pmatrix}$ into diagonal form. (07 Marks)

c. Solve the following system of equations by Gauss-Seidal method. $20x + y - 2z = 17$, $3x + 20y\text{-}z = -18$, $2x - 3y + 20z = 25$ [carryout three iterations]. (07 Marks)

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USN ☐☐☐☐☐☐☐☐☐☐   **18MAT21**

Second Semester B.E. Degree Examination, July/August 2021
Advanced Calculus and Numerical Methods

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions.*

1   a.   Find the divergence and curl of the vector, $\vec{V} = (xyz)i + (3x^2y)j + (xz^2 - y^2z)k$ at the point $(2, -1, 1)$.   **(06 Marks)**

    b.   Find the workdone in moving a particle in the force field $F = 3x^2i + (2xz - y)i + zk$ along the curve defined by $x^2 = 4y$, $3x^3 = 8z$ from $x = 0$ to $x = 2$.   **(07 Marks)**

    c.   Evaluate the surface integral $\iint_S \vec{F}.\vec{N}ds$ where $\vec{F} = 4xi - 2y^2j + z^2k$ and S is the surface bounding the region $x^2 + y^2 = 4$, $z = 0$ and $z = 3$.   **(07 Marks)**

2   a.   Find Curl (Curl $\vec{A}$) where $\vec{A} = x^2yi - 2xzj + 2yzk$ at the point $(1, 0, 2)$.   **(06 Marks)**

    b.   If $\vec{u} = x^2i + y^2j + z^2k$ and $\vec{v} = yzi + zxj + xyk$, show that $\vec{u} \times \vec{v}$ is solenoidal.   **(07 Marks)**

    c.   Evaluate $\int_C (\sin z\,dx - \cos x\,dy + \sin y\,dx)$ by using Stoke's theorem, where C is the boundary of the rectangle $0 \le x \le \pi$, $0 \le y \le 1$ and $z = 3$.   **(07 Marks)**

3   a.   Solve: $(D^4 - 1)\, y = 0$ **(06 Marks)**

    b.   Solve: $\dfrac{d^3y}{dx^3} - \dfrac{d^2y}{dx^2} + 4\dfrac{dy}{dx} - 4y = \sinh(2x + 3)$ by Inverse differential operator method.   **(07 Marks)**

    c.   Solve: $x^3\dfrac{d^3y}{dx^3} + 3x^2\dfrac{d^2y}{dx^2} + x\dfrac{dy}{dx} + y = x + \log x$ **(07 Marks)**

4   a.   Solve: $\dfrac{d^2y}{dx^2} + \dfrac{dy}{dx} + y = (1 - e^x)^2$ **(06 Marks)**

    b.   Solve: $(D - 2)^2y = 8\,(e^{2x} + x + x^2)$ by Inverse differential operator method.   **(07 Marks)**

    c.   A particle moves along the x-axis according to the law $\dfrac{d^2x}{dt^2} + \dfrac{6dx}{dt} + 25x = 0$. If the particle is started at $x = 0$ with an initial velocity of 12ft/sec to the left, determine x(t).   **(07 Marks)**

5   a.   Form the partial differential equation by eliminating the arbitrary constants in $(x - a)^2 + (y - b)^2 = z^2 \cot^2\alpha$, where α is the parameter.   **(06 Marks)**

    b.   Solve $\dfrac{\partial^2 z}{\partial x \partial y} = \text{Sin}x\ \text{Sin}y$ for which $\dfrac{\partial z}{\partial y} = -2\text{Sin}y$ when $x = 0$ and $z = 0$ if y is an odd multiple of $\pi/2$.   **(07 Marks)**

    c.   Derive one dimensional heat equation.   **(07 Marks)**

6 a. Form the partial differential equation by eliminating the arbitrary functions from $Z = f(x + at) + g(x - at)$. **(06 Marks)**

b. Solve $\dfrac{\partial^2 z}{\partial y^2} = z$ given that when $y = 0$, $z = e^x$ and $\dfrac{\partial z}{\partial y} = e^{-x}$. **(07 Marks)**

c. Solve $\dfrac{\partial u}{\partial x} + \dfrac{\partial u}{\partial y} = 2(x + y)u$, by the method of separation of variables. **(07 Marks)**

7 a. Find the nature of the series $\displaystyle\sum_{n=1}^{\infty} a^{n^2} x^n$, $a < 1$ **(06 Marks)**

b. Prove that: $J_{Y_2}(x) = \sqrt{\dfrac{2}{\pi x}} \, Sinx$ **(07 Marks)**

c. If $x^3 + 2x^2 - x + 1 = aP_0(x) + bP_1(x) + cP_2(x) + dP_3(x)$ find the values of a, b, c, d. **(07 Marks)**

8 a. Test for convergence the series,
$$\dfrac{1^2}{2} + \dfrac{2^2}{2^2} + \dfrac{3^2}{2^3} + \dfrac{4^2}{2^4} + \dots\dots$$ **(06 Marks)**

b. Express $x^3 + 2x^2 - 4x + 5$ interms of Legendre polynomials. **(07 Marks)**

c. Show that i) $P_2(\cos\theta) = \dfrac{1}{4}(1 + 3\cos 2\theta)$ ii) $P_3(\cos\theta) = \dfrac{1}{8}(3\cos\theta + 5\cos 3\theta)$.

(07 Marks)

9 a. From the following table of half yearly premium for policies maturing at different ages, estimate the premium for policies maturing at age of 46. **(06 Marks)**

Age	45	50	55	60	65
Premium (In Rupees)	114.84	96.16	83.32	74.48	68.48

b. Find cube root of 37 correct to 3 decimal places, using Newton-Raphson method. **(07 Marks)**

c. Use Simpson's $1/3^{rd}$ rule to find $\displaystyle\int_0^{0.6} e^{-x^2} dx$ by taking 6 sub-intervals. **(07 Marks)**

10 a. Using Newton's backward Interpolation formula, find the interpolating polynomial function given by the following table:

x	10	11	12	13
f(x)	22	24	28	34

(06 Marks)

b. Find a Real Root of the equation $x^3 - 2x - 5 = 0$ correct to three decimal places using Regula Falsi method. **(07 Marks)**

c. Evaluate $\displaystyle\int_0^1 \dfrac{x\,dx}{1 + x^2}$ by Weddle's rule taking seven ordinates. **(07 Marks)**

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First/Second Semester B.E. Degree Examination, July/August 2021
Elements of Civil Engineering and Mechanics

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions.*

1   a.   Explain the role of civil engineers in the infrastructural development.   **(06 Marks)**
     b.   Define: parallelogram law of force, resolution and composition of force.   **(06 Marks)**
     c.   Find the magnitude and direction and position of resultant force for the system shown in Fig.Q.1(c).   **(08 Marks)**
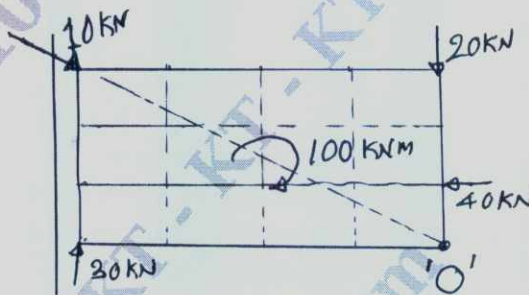

Fig.Q.1(c)

2   a.   Explain different fields and scope of different field of Civil Engineering.   **(06 Marks)**
     b.   State and prove Varignon's principle of moments.   **(06 Marks)**
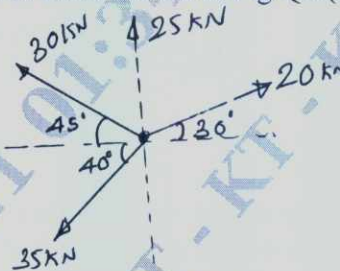   c.   Find the resultant for the system of force shown in Fig.Q.2(c).   **(08 Marks)**

Fig.Q.2(c)

3   a.   Find the tension in the cable for the system shown in Fig.Q.3(a) take AB parallel to CD.   **(08 Marks)**
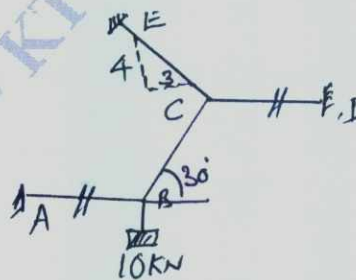

Fig.Q.3(a)

     b.   Explain limiting friction and laws of friction.   **(04 Marks)**

c. The block A and B weighing 20kN and 15kN are connected by a wire passing over smooth frictionless pulley as shown in Fig.Q.3(c). Determine the magnitude of force p required to impend the motion. Take $\mu = 0.2$. **(08 Marks)**
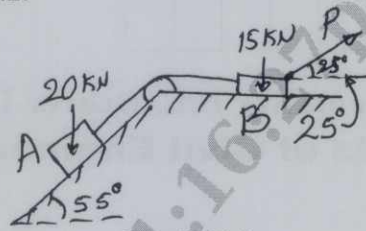

Fig.Q.3(c)

4 a. Find the reaction at the surface of contact for two identical cylinder as shown in Fig.Q.4(a) weight of cylinder 1000N. **(08 Marks)**
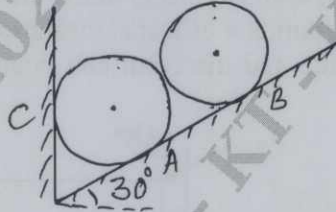

Fig.Q.4(a)

b. Define: i) Equilibrium   ii) Lamis theorem. **(04 Marks)**

c. A body resting on horizontal require a pull of 180N inclined at 30° to the horizontal just to move it. It was found that push of 220N inclined at 30° to the horizontal to move the same. Determine the weight of body and coefficient of friction. **(08 Marks)**

5 a. Explain different types of loads and supports with the help of sketches. **(06 Marks)**
   b. What are the assumption made in the analysis of trusses? **(04 Marks)**
   c. Determine the reaction at support for the beam shown in Fig.Q.5(c). **(10 Marks)**
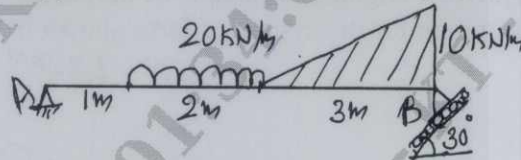

Fig.Q.5(c)

6 a. Explain the methods of analysis of trusses. **(04 Marks)**
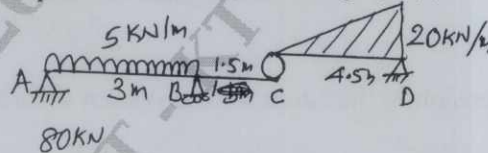   b. Find the reaction for the compound beam shown in Fig.Q.6(b). **(08 Marks)**

Fig.Q.6(b)

c. Analyze the truss shown in Fig.Q.6(c) and tabulate the forces in the members. **(08 Marks)**
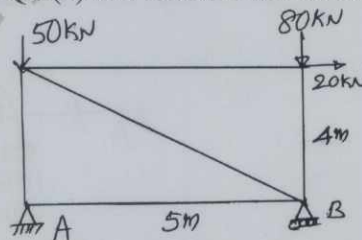

Fig.Q.6(c)

2 of 3

7   a.   Define centroid. Distinguish between centroid and center of gravity.   (04 Marks)
    b.   Derive center of gravity for semicircle of radius 'r'.   (06 Marks)
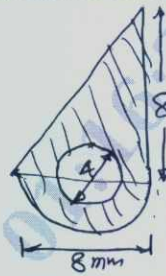   c.   Find I_{XX}, I_{YY} above CG axis for the area shown in Fig.Q.7(c).   (10 Marks)

Fig.Q.7(c)

8   a.   Define: i) Moment of Inertia   ii) Parallel axes theorems   iii) Perpendicular axis theorems
         iv) Radius of gyration.   (04 Marks)
    b.   Find the CG with respect to XY axis for the area shown in Fig.Q.8(b).   (08 Marks)
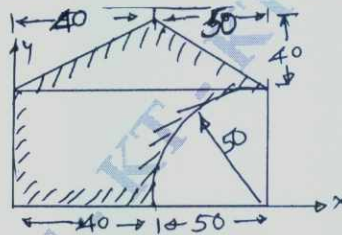
Fig.Q.8(b)

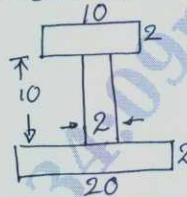   c.   Find I_{XX} and I_{YY} for the area shown in Fig.Q.8(c).   (08 Marks)

Fig.Q.8(c)

9   a.   Derive the equation for the path of a projectile. Obtain the expression for max height, time
         of flight and max range.   (08 Marks)
    b.   An aeroplane is flying horizontally at a height 8000m. A bomb is released from aeroplane
         having speed 600kmph. Determine the time required for the bomb to reach ground and
         horizontal distance travelled by the bomb.   (06 Marks)
    c.   A tower 90 height A particle is dropped from top of the tower at the same time another
         particle is projected upwards from foot of the tower both meet at 3am from bottom. Find the
         velocity of projection of second particle.   (06 Marks)

10 a.   Explain Newtons laws of motion.   (04 Marks)
    b.   Explain: i) Super elevation   ii) Rectilinear and curvilinear motion   iii) Projectile motion.   (06 Marks)
    c.   A projectile is fired from the edge of a 150m high cliff with an initial velocity 180m/sec at
         an angle of elevation of 30° with horizontal. Find:
         i)   Horizontal distance between gun and point where the bullet strikes the ground.
         ii)   Greatest height above the ground reached by projectile.
         iii) Actual velocity with which bullet strikes the ground.   (10 Marks)

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First/Second Semester B.E. Degree Examination, July/August 2021
Engineering Chemistry

Time: 3 hrs.   Max. Marks:100

Note: Answer any FIVE full questions.

1   a. Define free energy and derive Nernst equation for single electrode potential of an electrode.
    (06 Marks)
    b. Calculate the emf a Fe-Ag cell in which Fe is in contact with 0.1M $FeSO_4$ solution and Ag is in contact with 0.1M Ag NO_3 solution. The standard reduction potentials of Fe and Ag are $-0.44V$ and $+0.80V$ respectively. **(07 Marks)**
    c. Explain the construction and working of Lithium – ion battery. Mention its applications.
    (07 Marks)

2   a. Explain the construction and working of Ni-metal hydride battery. Mention its applications.
    (07 Marks)
    b. What are ion–selective electrodes? Describe the construction and working of glass electrode.
    (07 Marks)
    c. The emf a cell Ag|Ag NO_3(0.001M)||AgNO_3(XM)|Ag is 0.0591V at 25°C. Find the value of X. **(06 Marks)**

3   a. Explain electrochemical theory of corrosion taking iron as an example.   **(07 Marks)**
    b. Explain the process of :
       i) Galvanising
       ii) Anodizing.   **(07 Marks)**
    c. Define the term :
       i)   Polarization
       ii) Decomposition potential
       iii) Overvoltage.   **(06 Marks)**

4   a. Explain the following factors affecting rate of corrosion
       i) Nature of corrosion product
       ii) Ratio of anodic to cathodic area.   **(07 Marks)**
    b. What is meant by metal finishing? Mention (any 5) technological importance of metal finishing. **(07 Marks)**
    c. Describe electroless plating of copper with plating reaction and mention its application.
    (06 Marks)

5   a. Describe the Bomb calorimetric method for determination of calorific value of fuel.
    (07 Marks)
    b. What do you mean by knocking in IC engine? Explain mechanism of knocking.   **(07 Marks)**
    c. What are fuel cells? Mention advantages and limitations of fuel cell. How the fuel cell differs from battery (conventional cell). **(06 Marks)**

6 a. What are Photovoltaic cell? Describe construction, working and application of typical PV cell. **(07 Marks)**
   b. Explain the preparation of solar grade silicon by union Carbide process. **(07 Marks)**
   c. Calculate the higher and lower calorific value of a coal sample from the following data obtained in bomb calorimetric experiment.

   i)   Weight of coal   = 0.65 g
   ii) Weight of water in calorimeter   = 1200 g
   iii) Water equivalent of calorimeter W   = 400 g
   iv) Latent heat of steam   = 587×4.2 kJ/kg
   v)   Hydrogen in coal sample   = 2%
   vi) Rise in temperature   = 1.8°C
   vii) Sp-heat of water   = 4.187kJ/kg/°C.   **(06 Marks)**

7 a. What are the sources, effects and control method of oxides of sulphur. **(07 Marks)**
   b. What are the sources, effects and control of oxides of nitrogen pollution? **(07 Marks)**
   c. In COD test 25ml and 14ml of 0.05N FAS solution are required for blank and sample titration respectively. The volume of test sample used was 25ml. Calculate the COD of sample solution. **(06 Marks)**

8 a. What do you mean by desalination of water? Explain the reverse osmosis process for desalination of water. **(07 Marks)**
   b. Explain the determination of sulphate content in water by gravimetric method. **(07 Marks)**
   c. What are the sources and ill effect of secondary pollutant ozone? Explain ozone depletion. **(06 Marks)**

9 a. Explain theory, Instrumentation and Application of flame photometry. **(07 Marks)**
   b. Explain the theory and instrumentation of potentiometer. **(07 Marks)**
   c. Write a note on fullerene. Mention its application. **(06 Marks)**

10 a. Explain the theory, instrumentation and application of conductometry in the titration of mixture of strong acid and weak acid with a strong base. **(07 Marks)**
   b. Explain the synthesis of nanomaterials by sol-gel process. **(07 Marks)**
   c. Describe the properties and application of :
      i) Carbon nature
      ii) Graphenes. **(06 Marks)**

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CBCS SCHEME

USN | | | | | | | | | |

First/Second Semester B.E. Degree Examination, July/August 2021
Engineering Physics

Time: 3 hrs.

Max. Marks: 100

Note : 1. *Answer any FIVE full questions.*
2. *Physical constants : $C = 3 \times 10^8 m/s$; $h = 6.63 \times 10^{-34} JS$;*
$g = 9.8 \ m/s^2$; $\epsilon_0 = 8.856 \times 10^{-12} \ F/m$; $M = 9.11 \times 10^{-31} kg$;
$e = 1.6 \times 10^{-19} C$; $N_A = 6.02 \times 10^{26}/K$ mole ; $K = 1.38 \times 10^{-23} J/K$

1   a. Define Simple Harmonic motion. Derive the equation of motion for Simple Harmonic motion. Explain how complex notation is used in Simple Harmonic motion. **(10 Marks)**
    b. Define Shock waves. Mention its applications. **(06 Marks)**
    c. A mass 0.5kg causes an extension 0.03m in a spring and the system is set for oscillations. Find force constant of the spring, angular frequency and period of resulting oscillations. **(04 Marks)**

2   a. What are Damped Oscillations? Give the theory of damped oscillations and discuss the case of over damping. **(10 Marks)**
    b. Describe Hand Operated Reddy Shock tube with the help of diagram. **(06 Marks)**
    c. A free particle is executing Simple Harmonic motion in straight line. The maximum velocity it attains during any oscillation is 62.8m/s. Find the frequency of oscillation if its amplitude is 0.5m. **(04 Marks)**

3   a. Define Young's modulus, Rigidity modulus and Poisson's ratio. Derive the relation between them. **(10 Marks)**
    b. Describe Strain softening and Strain hardening. **(06 Marks)**
    c. Calculate the force required to produce an extension of 1mm in steel wire of length 2m and diameter 1mm. If given $Y = 2 \times 10^{11}$ N/m^2. **(04 Marks)**

4   a. State Hook's law. Derive an expression for Couple required to produce unit twist in a uniform cylindrical rod fixed at one end and the Couple being applied at the other end. **(08 Marks)**
    b. What is Torsional Pendulum? Give the expression for period of oscillation and write its applications. **(06 Marks)**
    c. A solid lead sphere of radius 10.3m is subjected to normal pressure of 10N/m^2 acting all over the surface. Determine the change in its volume. Given Bulk modulus of lead is 4.58×10^{10} N/m^2. **(06 Marks)**

5   a. State and prove Gauss Divergence theorem. **(06 Marks)**
    b. Describe three types of optical fibres with one application for each type. **(09 Marks)**
    c. Calculate the curl of $\vec{A}$. Given $\vec{A} = (1 + yz^2) \ \hat{a}_x + xy^2 + x^2y \ \hat{a}_z$. **(05 Marks)**

6   a. Discuss Continuity equation and list the four Maxwell's equations. **(10 Marks)**
    b. What is Numerical Aperture? Derive and expression for numerical aperture interms of refractive indices of core and cladding. **(06 Marks)**
    c. Find the attenuation in an optical fiber of length 500m. When a light signal of power 100mw. Emerges out of the fiber with a power 90mw. **(04 Marks)**

7 a. State Heisenberg's uncertainity principle. Show that electron does not exist inside the nucleus by this principle. (06 Marks)

  b. Explain the terms Spontaneous emission and stimulated emission. Derive the expression for energy density of radiation under equilibrium condition interms of Einstein's coefficients. (10 Marks)

  c. An electron is bound in an one dimensional potential well of width $1A°$, but infinite height. Find its energy values in ground state and in the first two excited states. (04 Marks)

8 a. Using time independent wave equation, find Energy Eigen values and Eigen functions for a particle in one dimensional potential well of infinite height. (09 Marks)

  b. Describe the Construction and working of CO_2 Laser with energy level diagram. (07 Marks)

  c. The average output Power of Laser source emitting a laser beam of wavelength $6328A°$ is 5mw. Find the number of Photons emitted per second by the laser source. (04 Marks)

9 a. Define Fermi energy and Fermi factor. Derive an expression for Fermi energy at Zero Kelvin. (09 Marks)

  b. Obtain the expression for electrical conductivity of Semi Conductor. (07 Marks)

  c. If a $NaCl$ crystal is subjected to an electric field of $1000V/m$ and the resulting Polarization is 4.3×10^{-8} C/m^2. Calculate the dielectric constant of $NaCl$. (04 Marks)

10 a. Discuss any two success of Quantum Free Electron theory. (06 Marks)

  b. State Hall effect. Obtain an expression for Hall Coefficient. (08 Marks)

  c. Derive Calusius – Mossotti equation. (06 Marks)

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18ELE13/23

First/Second Semester B.E. Degree Examination, July/August 2021
Basic Electrical Engineering

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions.*

1 a. State and explain: i) Ohm's law   ii) Kirchoff's voltage law. **(06 Marks)**
   b. Define: i) frequency   ii) time period   iii) form factor. **(06 Marks)**
   c. Determine:
      i) Current flowing through 12Ω and 8Ω resistances
      ii) Total power dissipated
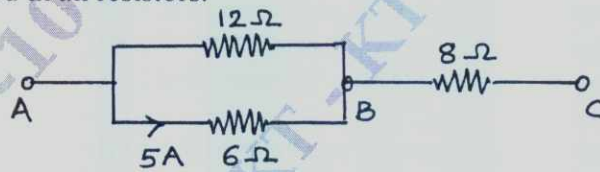   iii) Power dissipated in all resistors. **(08 Marks)**

Fig.Q.1(c)

2 a. Define the RMS value of an alternating current and show that its value is proportional to maximum value. **(06 Marks)**
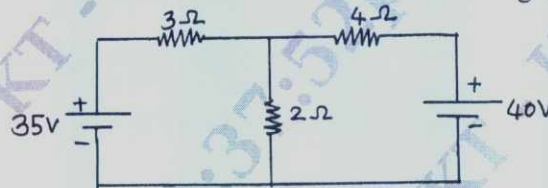   b. Apply Kirchoff's laws to calculate the current in 2Ω resistor in Fig.Q.2(b). **(06 Marks)**

Fig.Q.2(b)

   c. An alternating current 'i' is given by i = 141.4 sin 314t, find: i) maximum value   ii) frequency   iii) time period   iv) instantaneous value when t = 3ms. **(08 Marks)**

3 a. Show that current lags the applied voltage v = vm sin wt by 90 in a pure inductive A-C circuit and also power consumed is zero. **(08 Marks)**
   b. List the advantages of 3 phase A.C system over 1 phase A.C system. **(06 Marks)**
   c. A 318μF capacitor is connected across a 230volts, 50Hz, AC supply. Determine:
      i) Capacitive reactance   ii) RMS value of current   iii) Voltage and current expressions. **(06 Marks)**

4 a. Show that the power in a 3 phase balanced star connected load can be measured by two wattmeters with suitable circuit diagram and vector diagrams. **(08 Marks)**
   b. Explain the following with respect to single phase A.C system:
      i) Power factor
      ii) True power
      iii) Reactive power
      iv) Apparent power **(06 Marks)**
   c. Three 50Ω resistors are connected in star across 400V, 3 phase, 50Hz, AC supply. Find phase current, line current and power taken from the mains. **(06 Marks)**

5 a. Explain the basic working principle of transformer and identify the applications of transformers (any two). **(06 Marks)**

   b. Explain the two way control of lamp with suitable diagram and working table. **(06 Marks)**

   c. A single phase, 50Hz, transformer has 30 primary turns and 350 secondary turns. The net cross sectional area of the core is 250cm^2. If the primary winding is connected to a 230V, 50Hz, AC supply. Calculate:
   i) Peak value of flux density in the core
   ii) Voltage induced in the secondary winding
   iii) Primary current when the secondary current is 100A (Neglecting losses). **(08 Marks)**

6 a. Explain the concealed conduit wiring with a neat diagram and mention its advantages. **(08 Marks)**

   b. A 10KVA transformer has iron loss of 450W and full load copper loss of 650W. If the power factor of the load is 0.8 lagging. Calculate: i) Full load efficiency ii) Load at maximum η iii) Maximum efficiency at unity power factor. **(06 Marks)**

   c. Explain the following with respect to electric circuit i) Earthing ii) Electric shock iii) Fuse wire iv) MCB v) meter board. **(06 Marks)**

7 a. Explain the basic working principle of d.c generator with suitable diagrams. **(06 Marks)**

   b. What is torque? Show that the armature torque is proportional to armature current in d.c motor. **(06 Marks)**

   c. An 8 pole lap connected armature has 960 conductors, a flux of 40mwb per pole and a speed of 400RPM. Calculate the emf generated. If the armature were wave connected, at what speed it must be driven to generate 400V? **(08 Marks)**

8 a. How the dc generators are classified? Explain each one in brief. **(06 Marks)**

   b. Explain the D.C series motor characteristics with suitable plots. **(06 Marks)**

   c. A 250V, shunt motor takes a total current of 20A Rsh = 200Ω, Ra = 0.3Ω. Find the current in armature and back emf. **(08 Marks)**

9 a. Explain the constructional details of 3 phase synchronous generator. **(06 Marks)**

   b. A 3 ph, induction motor is wound for 4 poles and is supplied from 50Hz system. Calculate:
   i) Synchronous speed ii) Speed of motor when slip is 4% iii) rotor current frequency when motor runs at 600rpm. **(08 Marks)**

   c. Derive an expression to calculate the frequency of generated emf. **(06 Marks)**

10 a. Explain the basic working principle of 3 phase induction motor with suitable diagrams. **(06 Marks)**

   b. A 6 pole, 3 phase, 50Hz, alternator has 12 slots per pole and 4 conductors per slot. A flux of 25mWb is sinusoidally distributed along the air gap. Determine the i) Phase EMF ii) Line EMF, is the alternator is star connected. Assume pitch factor = 1 winding factor = 0.96. **(06 Marks)**

   c. Why the 3 phase induction motor stops at slip = 0, explain the working of star-delta starter with a neat diagram. **(08 Marks)**

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CBCS SCHEME

First/Second Semester B.E. Degree Examination, July/August 2021
C Programming for Problem Solving

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions.*

1 a. Explain different generations of computer. **(10 Marks)**
   b. With a neat block diagram of computer explain its components. **(10 Marks)**

2 a. Write the basic structure of C program. Briefly explain each section. **(08 Marks)**
   b. Classify the operators based on the number of operands. Explain with one example for each. **(08 Marks)**
   c. State whether the following are valid identifiers or not: integer, char, _for, while. **(04 Marks)**

3 a. With neat syntax explain formatted input and output functions. **(06 Marks)**
   b. Compare while and do-while loops. **(04 Marks)**
   c. Write a C program to display the Pascal's triangle. **(10 Marks)**

4 a. With neat syntax and example, explain if, if…else and switch statements. **(10 Marks)**
   b. Write a C program to find the roots of a quadratic equation. **(10 Marks)**

5 a. What is string? With example, explain the following spring manipulation functions strcpy, strcmp, strcat and strrev. **(10 Marks)**
   b. Write a C program to sort the list of numbers using bubble sort technique. **(10 Marks)**

6 a. What is an Array? Explain the declaration and initialization of one dimensional array. **(10 Marks)**
   b. Write a C program to search a given key element from the list of elements using binary search technique. **(10 Marks)**

7 a. With neat syntax explain the following:
   i) Function declaration
   ii) Function cal
   iii) Function definition. **(06 Marks)**
   b. Explain global variables and static variables. **(04 Marks)**
   c. What is function? List and explain the categories of user defined functions. **(10 Marks)**

8 a. What is recursive function? Write a C program to find the factorial of a number using recursion. **(06 Marks)**
   b. Write a C program to find Fibonacci series using function. **(08 Marks)**
   c. Explain call by value and call by reference functions. **(06 Marks)**

9   a.   Define structure. Explain how structure members are accesses using dot (·) operator.

(04 Marks)

      b.   Write a C program to accept RollNo, Name, and Marks of students and display the sum and average of the marks using structure.   (10 Marks)

      c.   What is pointer? With example explain how pointer variables are declared and initialized.

(06 Marks)

10   a.   What is preprocessor directive? Explain #define preprocessor directive.   (04 Marks)

      b.   Write a C program to compute the sum, mean and standard deviation of elements stored in an array of n real numbers using pointers.   (10 Marks)

      c.   With example explain structure within structure.   (06 Marks)

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CBCS SCHEME

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18ELN14/24

First/Second Semester B.E. Degree Examination, July/August 2021
Basic Electronics

Time: 3 hrs.

Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Explain the operation of p–n junction Diode under unbiased condition with a neat diagram.
   (08 Marks)

   b. In a full wave rectifier, input is from $30 - 0 - 30V$. The load and R_f are 100Ω and 10Ω respectively. Calculate area voltage, efficiency, percentage regulation.
   (06 Marks)

   c. Determine I_D, V_1, V_2 and V_0 for the given circuit.
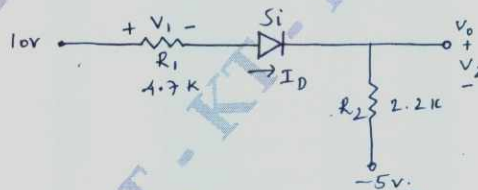
Fig.Q1(c)
   (06 Marks)

2 a. With a neat diagram and waveforms explain the working of a bridge rectifier.
   (08 Marks)

   b. Explain the operation of a zener diode with line regulation and load regulation.
   (08 Marks)

   c. For a zener regulator shown in Fig.Q2(c), calculate the range of input voltage for which output remain constant. $V_Z = 6.1V$, $I_{Zmin} = 2.5mA$, $I_{Zmax} = 25mA$, $r_Z = 0\Omega$.
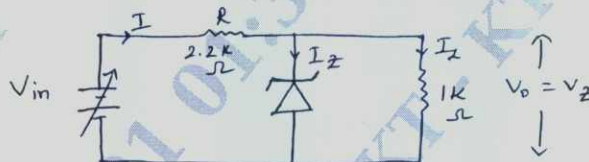

Fig.Q2(c)
   (04 Marks)

3 a. Explain the characteristics of N-channel JFET(Drawn and transfer characteristics). **(12 Marks)**

   b. For a N-channel JFET, $I_{DSS} = 8mA$, $V_P = -5V$. Find :
   i) I_D @ $V_{GS} = -2V$ and $-3V$
   ii) V_{GS} @ $I_D = 3mA$ and $5mA$.
   (06 Marks)

   c. List out classification of FET with symbols.
   (02 Marks)

4 a. Draw and explain forward and reverse characteristics of an SCR.
   (07 Marks)

   b. Sketch the transfer and drain characteristics for an n-channel depletion – type MOSFET for the range of values of $V_{GS} = -6V$ to $+1V$ with $I_{DSS} = 8mA$, $V_P = V_{GS(off)} = -6V$.
   (08 Marks)

   c. With a neat diagram, explain the 2 transistor model of SCR.
   (05 Marks)

5 a. Explain following with respect to OP-Amp.
   i) Virtual ground   ii) CMRR   iii) Slew rate
   iv) Offset voltage   v) Matched transistors.
   (10 Marks)

   b. Derive the expression for output voltage of an
   i) integrator   ii) inverting summing amplifier. With a neat circuit diagram.
   (10 Marks)

6 a. Explain the ideal characteristics of on op-Amp. **(08 Marks)**

b. Derive the expression for output voltage of an non inventing amplifier with a neat circuit and waveform. **(08 Marks)**

c. Design an adder circuit using an op-Amp to obtain output expression.
$V_0 = -2(0.1V_1 + 0.5V_2 + 20V_3)$. **(04 Marks)**

7 a. Explain the operation of BJT as an amplifier and as a switch. **(10 Marks)**

b. Draw and explain the operation of a voltage series –ve feedback amplifier and derive an expression for its input impedance. **(10 Marks)**

8 a. Define an oscillator. Explain Brakhausen's criteria for oscillations with block diagram. **(06 Marks)**

b. Derive the expression for frequency of oscillations of Wien bridge oscillator. **(08 Marks)**

c. With a neat diagram, explain the working of RC phase shift oscillator. **(06 Marks)**

9 a. Subtract $(111001)_2$ from $(101011)_2$ using 2's complement method. **(04 Marks)**

b. State and prove Demorgan's theorem for 3 variables. **(04 Marks)**

c. Simplify the following Boolean expression :

   i) $A + \overline{A}B = A + B$

   ii) $\overline{X}YZ + \overline{X}\overline{Y}Z + \overline{X}Y + X\overline{Y}$

   iii) $\overline{\overline{XY + XYZ} + X(Y + X\overline{Y})}$

   iv) $ABC + A\overline{B}C + AB\overline{C} + \overline{A}BC$

   v) $\overline{A\overline{B} + ABC} + A(\overline{B} + A\overline{B})$

   vi) $AB + \overline{AC} + AB\,C(AB + C)$. **(12 Marks)**

10 a. With block diagram and truth table, explain the operation of full ladder using 2 half adder. **(08 Marks)**

b. Explain the operation NOT, AND and OR gates using analogous switch equivalent circuit. **(09 Marks)**

c. Implement Ex – OR gate using only NOR gate. **(03 Marks)**

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First/Second Semester B.E. Degree Examination, July/August 2021
Elements of Mechanical Engineering

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions.
2. Use of Thermodynamics data hand book is permitted.
3. Use of steam tables is permitted.

1   a.   Explain briefly the principle of power plant with a neat sketch.   **(10 Marks)**
  b.   Write a note on following solar energy technologies:
      (i)   Photovoltaic technology
      (ii)   Flat plate collector   **(10 Marks)**

2   a.   Briefly describe steam formation with the help of T-H diagram.   **(10 Marks)**
  b.   Find the enthalpy of 1 kg of steam at 12 bar when (i) Steam in dry saturated (ii) Steam is 22% wet (iii) super heated to 250°C. Use the steam table. Assume the specific heat of the super heated steam as 2.25 kJ/kgK.   **(06 Marks)**
  c.   Define the following: (i) Sensible heat (ii) Degree of superheat.   **(04 Marks)**

3   a.   Explain the working principle of Lancashire boiler with neat sketch.   **(10 Marks)**
  b.   Explain how to classify the water turbine.   **(04 Marks)**
  c.   Differentiate between pelton wheel turbine and Kaplan turbine.   **(06 Marks)**

4   a.   With a neat sketch, explain the working principle of centrifugal pump.   **(10 Marks)**
  b.   Explain the working principle of Kaplan turbine with a neat sketch.   **(10 Marks)**

5   a.   Differentiate between SI engine and CI engine.   **(04 Marks)**
  b.   Explain the working principle of 4-stroke SI engine with P-V diagram.   **(10 Marks)**
  c.   A 2 stroke C.I. engine has a cylinder diameter of 200 mm and stroke length of 300 mm. The engine has a mean effective pressure of 2.8 bar and a speed of 400 rpm. The effective diameter of break drum is 1 m and effective load on it is 64 kg. Determine the following :
      (i) IP   (ii) BP   (iii) Mechanical efficiency   **(06 Marks)**

6   a.   Define the following:
      (i)   Refrigeration
      (ii)   Refrigerating effect
      (iii) Ton of refrigeration
      (iv) Ice making capacity   **(08 Marks)**
  b.   Differentiate between VCR and VAR.   **(06 Marks)**
  c.   Explain the working of room air condition system with a neat sketch.   **(06 Marks)**

7   a.   Write a note on classification and application of ferrous and nonferrous metals.   **(10 Marks)**
  b.   Define the following:
      (i)   Welding
      (ii)   Brazing
      (iii) Soldering   **(06 Marks)**
  c.   Define composite material. Mention any two applications.   **(04 Marks)**

8 a. Derive an equation for length of belt in cross belt drive. (10 Marks)
   b. Write a note on velocity ratio of belt drive. (04 Marks)
   c. A gear wheel of 20 teeth drives another gear wheel having 36 teeth running at 200 rpm, find the speed of the driving wheel and the velocity ratio. (06 Marks)

9 a. Explain the following operations on lathe with suitable sketches:
      (i)   Facing
      (ii)   Thread cutting
      (iii) Plain turning
      (iv)   Knurling (08 Marks)
   b. Explain the following operations on milling machines with suitable sketches:
      (i) Plain milling
      (ii) Slot milling
      (iii) Straddle milling
      (iv) Gang milling (08 Marks)
   c. Explain taper turning by compound slide swiveling method with sketch. (04 Marks)

10 a. Explain the basic components of CNC machine with a block diagram. (10 Marks)
   b. What are the applications of Robots and also write down the advantages of robots. (10 Marks)

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Question Paper Version : A

First Semester B.E. Degree Examination, July/August 2021
Technical English – I

(COMMON TO ALL BRANCHES)

Time: 3 hrs.]   [Max. Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the hundred questions, each question carries one mark.

2. Use only **Black ball point pen** for writing / darkening the circles.

3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**

4. Darkening two circles for the same question makes the answer invalid.

5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

Identify the words which means the same as the given phrase.

1.   The quality of being transitory or perishable
     a) coincidence   b) decay   c) caducity   d) accidental

2.   Characterized by very widespread growth or extent
     a) demagogue   b) democracy   c) epidemic   d) endemic

3.   The kind of mystery which cannot be explored
     a) inscrutable   b) inevitable   c) invisible   d) inapplicable

4.   A very large building or the other structure
     a) lithium   b) megalite   c) monolith   d) lithography

5.   The third syllable of a word counting from the end
     a) antedate   b) antebrachium   c) antecede   d) antepenult

6.   A mass departure of people
     a) influx   b) emigration   c) emergence   d) exodus

7.   An event causing sudden damage or disaster
     a) antipathy   b) antimony   c) animosity   d) catastrophe

8.   A phrase or form of words written in memory of person
     a) epitaph   b) poem   c) recital   d) prayer

9.   Lying under or below
     a) conjugal   b) conjugate   c) subjacent   d) jugular

10. Deliberate killing of large number of people instigated by ethnic clash.
     a) extinction   b) endurance   c) epiphany   d) genocide

Choose the correct option from those given in each of the sentences below.

11. Which of the following is desired for effective communication?
    a) Redundancy   b) Clarity   c) Cliches   d) Circumlocution

12. Writing diary everyday is an example of _____ communication.
    a) Extrapersonal   b) Intrapersonal
    c) Organizational   d) Interpersonal

13. No communication is complete without
    a) Noise   b) Semantic barrier   c) Intrapersonal   d) feedback

14. Which one of the following is oral communication,
    a) Dictation   b) Brochures   c) Notices   d) Letters

15. Who encodes a message
    a) Sender   b) Receiver   c) Transmitter   d) Both (a) and (b)

Choose the irrelevant options in the following sentences.

16. The criminal is being_____ in the court.
    a) prosecuted   b) persecuted   c) perspective   d) perhaps

17. Don't be so_____, it is irritating to see you behave so stupidly.
    a) Childlike   b) Childish   c) Child   d) Children

18. Education system could aim at developing the _____ faculty of students.
    a) Imagine   b) Image   c) Imaginary   d) Imaginative

19. Both the parties have arrived in an _____ solution.
    a) Amicable   b) Amiable   c) Anger   d) Amide

20. After the blast, the militants seemed to be have taken ____ in safe places.
    a) reverse   b) refuge   c) revenge   d) refuse

Select the correct prefix or suffix from the given options to complete the gap.

21. Truth _____
    a) less   b) ful   c) ment   d) ism

22. _____ balance
    a) Un   b) Ir   c) Im   d) Non

23. _____Violence
    a) Un   b) In   c) Im   d) Non

24. Develop _____
    a) ment   b) less   c) ed   d) ing

25. _____ practise.
    a) Mal   b) Un   c) Re   d) Dis

Select the name of the collective noun of the following

26. A _____ of elephant.
    a) Stack   b) Herd   c) Mob   d) Gang

27. A _____ of ships.
    a) fleet   b) posy   c) crew   d) bunch

28. A _____ of ants.
    a) board   b) swarm   c) army   d) fleet

29. A _____ of fish.
    a) shoal   b) fleet   c) bunch   d) posy

30. A _____ of lions.
    a) crew   b) pride   c) bunch   d) fleet

Choose the appropriate homophones of the following words.

31. Alter
    a) altar   b) altor   c) altur   d) altir

32. Scene
    a) rain   b) seen   c) see   d) saw

33. Knew
    a) sew   b) now   c) know   d) new

34. Sight
    a) light   b) fight   c) site   d) wait

35. Write
    a) site   b) light   c) rite   d) effect

Identify the silent letter from options given below.

36. Castle
    a) c   b) a   c) t   d) e

37. Mechanic
    a) h   b) c   c) i   d) e

38. Knife
    a) i   b) k   c) f   d) n

39. Answer
    a) n   b) s   c) a   d) w

40. Lamb
    a) l   b) m   c) a   d) b

Choose appropriate question tag, to complete the following sentences.

41. Drive carefully on the road
    a) Can you?   b) Will you?   c) Do you?   d) Are you?

42. Someone is going to come
    a) Aren't they?   b) Isn't they?   c) Will they?   d) Do they?

43. Just keep quiet
    a) Won't you?   b) Will you?   c) Can you?   d) Aren't you?

44. Helen was a beautiful woman
    a) Wasn't she?   b) Isn't she?   c) Aren't she?   d) Didn't she?

45. We can't buy this costly car,
    a) Can't we?   b) Can we?   c) Could we?   d) Should'nt we?

Choose the correct spelling words which are commonly misspelt.

46. a) Comitee   b) Commiittee   c) Commite   d) Committee

47. a) que   b) q   c) queue   d) quue

48. a) common   b) comoon   c) comon   d) coomon

49. a) succes   b) success   c) succeess   d) suces

50. a) adress   b) address   c) adres   d) addres

Choose the correct parts of speech from the underlined words.

51. We had <u>breakfast</u> at a café
    a) noun   b) verb   c) pronoun   d) adjective

52. I helped him to carry <u>it</u>
    a) noun   b) pronoun   c) verb   d) preposition

53. My friend said "<u>Oh</u> ! What a cold weather !"
    a) conjunction   b) noun   c) verb   d) interjection

54. We <u>left</u> for the mountains
    a) verb   b) adjective   c) adverb   d) noun

55. You have to believe in <u>yourself</u>
    a) noun   b) pronoun   c) verb   d) adjective

Choose the correct antonyms for the following words.

56. Affluent
    a) Indigent   b) Poor   c) Rich   d) Excellent

57. Barbaric
    a) civilized   b) anxious   c) lovable   d) smooth

58. Rapid
    a) Clever   b) Sensible   c) Calm   d) Slow

59. Meagre
    a) few   b) generous   c) Study   d) ordinary

60. Refined
    a) Hard   b) Shorten   c) Crude   d) Steady

Choose the appropriate synonyms for the following words.

61. enormous
    a) huge   b) plenty   c) small   d) excellent

62. Garbage
    a) collect   b) trash   c) gify   d) finish

63. Abandon
    a) achieve   b) accomplish   c) accurate   d) forsake

64. Attire
    a) were   b) dress   c) coat   d) absent

65. Complex
    a) connect   b) manage   c) complicated   d) cunning

Break the following words into syllables.

66. Computer
    a) Com-puter   b) Compute-r   c) C-omputer   d) Com-put-er

67. Laminate
    a) Lam-i-nate   b) La-minate   c) Lami-nate   d) Laminate

68. National
    a) Na-tion-al   b) Nation-L   c) Natio-nal   d) Natio-n-al

69. Possible
    a) Possibl-e   b) Pos-si-ble   c) Possible   d) Poss-ible

70. Committee
    a) Com-mit-tee   b) Comm-itee   c) Commi-tee   d) Com-mitte

Choose the appropriate verb that agrees with the subject.

71. Someone_____ to have deliberately left this bag here.
    a) Seem   b) Seems   c) Seemed   d) is seen

72. The committee _____ appointed to study the question.
    a) was   b) were   c) are   d) here

73. One of the passengers _____ seriously injured.
    a) are   b) were   c) was   d) no verb

74. Both of the parents _____ equally responsible for the child's upbringing
    a) is   b) are   c) was   d) were

75. Besides the minister, the bodyguard _____ killed
    a) was   b) were   c) are   d) has

Insert appropriate pronouns in the blanks.

76. Everybody seems to have invested _____ money in the market.
    a) his   b) her   c) their   d) its

77. What has he been searching for? Has he misplaced_____ mobile again?
    a) his   b) her   c) it   d) the

78. Someone seems to have forgotten _____ library card at the counter.
    a) his   b) her   c) its   d) their

79. One cannot be too careful in life can _____.
    a) she   b) we   c) he   d) it

80. In India _____ don't get to learn phonetic symbols at the school levels.
    a) were   b) she   c) they   d) he

Choose the correct substitute for the following.

81. A government with a king at the head
    a) Monarchy   b) Oligarcy   c) Atocracy   d) Plutocracy

82. A study of the birds
    a) Anthropology   b) Archaeology   c) Ornithology   d) Physcology

83. Killing of a human
    a) suicide   b) homicide   c) regicide   d) patricide

84. One who is always hopeful
    a) Optimist   b) Plagiarist   c) Misognist   d) Pessimist

85. Handwriting which cannot be read
    a) Legible   b) Illegible   c) Illegal   d) Legal

Version A : Page 6 of 7

86. One who has no money
    a) Glutton   b) Hypocrite   c) Cynic   d) Pauper

87. One who has strange habits
    a) Inevitible   b) Cynic   c) Excentric   d) Gullible

88. One who writes under a different name
    a) pseudonym   b) biograph   c) autobiography   d) polyglot

89. A thing through which light can pass
    a) translucent   b) transparent   c) transfer   d) transmit

90. One who is all powerful
    a) Omnipresent   b) Omniscent   c) Omnipotent   d) Omnivorous

Choose the correct word.

91. Have you read the last _____ one poem of the book.
    a) before   b) either   c) but   d) because

92. The _____ of the magnet was predictable.
    a) effect   b) defect   c) affect   d) defeat

93. I have no _____ in this kind of books.
    a) like   b) dislike   c) interest   d) hate

94. We should not _____ the animals.
    a) like   b) tease   c) do   d) can't

95. I know they will not put you _____ the bars.
    a) behind   b) in   c) on   d) at

96. I would like to speak to _____ Principal.
    a) the   b) are   c) an   d) can

97. How beautiful _____ river looks?
    a) an   b) the   c) for   d) at

98. Does your father go _____ a walk?
    a) at   b) the   c) for   d) from

99. Have you _____ today's newspaper?
    a) reading   b) reads   c) reader   d) read

100. Peter has been in this college _____ 2015.
    a) for   b) since   c) from   d) to

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