CBCS SCHEME

USN [ ][ ][ ][ ][ ][ ][ ][ ][ ] **18MAT11**

First Semester B.E. Degree Examination, Jan./Feb. 2021
Calculus and Linear Algebra

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1. a. With usual notation, prove that $\dfrac{1}{p^2} = \dfrac{1}{r^2} + \dfrac{1}{r^4}\left(\dfrac{dr}{d\theta}\right)^2$ (06 Marks)

   b. Find the radius of curvature for the parabola $\dfrac{2a}{r} = 1 + \cos\theta$ (06 Marks)

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

OR

2. a. Find the angle of intersection of the curves $r = 2\sin\theta$ and $r = 2\cos\theta$ (06 Marks)

   b. Find the pedal equation of the curve $r^m = a^m[\cos m\theta + \sin m\theta]$ (06 Marks)

   c. For the curve $y = \dfrac{ax}{a+x}$, show that $\left(\dfrac{2\rho}{a}\right)^{\frac{2}{3}} = \left(\dfrac{x}{y}\right)^2 + \left(\dfrac{y}{x}\right)^2$ (08 Marks)

Module-2

3. a. Using Maclaurin's series, prove that

   $$\sqrt{1 + \cos 2x} = \sqrt{2}\left[1 - \dfrac{x^2}{2} + \dfrac{x^4}{24} - \dots\dots\right]$$ (06 Marks)

   b. Evaluate i) $\underset{x \to 0}{Lt}\left(\dfrac{1}{x}\right)^{2\sin x}$ ii) $\underset{x \to 0}{Lt}\left[\dfrac{a^x + b^x + c^x}{3}\right]^{\frac{1}{x}}$ (07 Marks)

   c. Examine the function $f(x, y) = 2 + 2x + 2y - x^2 - y^2$ for its extreme values. (07 Marks)

OR

4. a. If $u = f(y-z, z-x, x-y)$ then prove that $u_x + u_y + u_z = 0$. (06 Marks)

   b. If $u = 3x + 2y - z$; $v = x - 2y + z$; $w = x^2 + 2xy - xz$ then show that $\dfrac{\partial(u, v, w)}{\partial(x, y, z)} = 0$ (07 Marks)

   c. The pressure P at any point (x, y, z) in space $P = 400xyz^2$. Find the highest pressure at the surface of a unit sphere $x^2 + y^2 + z^2 = 1$. (07 Marks)

Module-3

5. a. Evaluate: $\displaystyle\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x + y + z)\,dx\,dy\,dz$ (06 Marks)

   b. Obtain the relation between Beta and Gama functions in the form $\beta(m, n) = \dfrac{\overline{|m}\cdot\overline{|n}}{\overline{|m+n}}$ (07 Marks)

   c. Find the centre of Gravity of the curve $r = a(1 + \cos\theta)$. (07 Marks)

1 of 2

OR

6 a. Change the order of integration and evaluate $\int\limits_{0}^{1}\int\limits_{\sqrt{y}}^{1}dx\,dy$ **(06 Marks)**

   b. A Pyramid is bounded by three coordinate planes and the plane $x + 2y + 3z = 6$. Compute the volume by double integration. **(07 Marks)**

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

Module-4

7 a. Solve $\left[y\left(x+\dfrac{1}{x}\right)+\cos y\right]dx + \left[x+\log x - x\sin y\right]dy$ **(06 Marks)**

   b. 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. **(07 Marks)**

   c. Prove that the system of confocal and coaxial parabolas $y^2 = 4a(x + a)$ is self orthogonal. **(07 Marks)**

OR

8 a. Solve: $xyp^2 - (x^2 + y^2)p + xy = 0$ **(06 Marks)**

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

   c. Solve the equation $L\dfrac{di}{dt} + Ri = E_o \sin wt$ where L, R and E_o are constants and discuss the case when t increases indefinitely. **(07 Marks)**

Module-5

9 a. Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$ using elementary row operation. **(06 Marks)**

   b. Find largest eigen value and eigen vector of the matrix $\begin{pmatrix} 4 & 1 & -1 \\ 2 & 3 & -1 \\ -2 & 1 & 5 \end{pmatrix}$ by taking $(1, 0, 0)^T$ as initial eigen vector by Rayleigh's power method (perform 6 iteration). **(07 Marks)**

   c. Solve the system of equations $x + y + z = 9$; $x - 2y + 3z = 8$; $2x + y - z = 3$, by Gauss Jordan method. **(07 Marks)**

OR

10 a. For what value of λ and μ the system of equations $x + y + z = 6$; $x + 2y + 3z = 10$; $x + 2y + \lambda z = \mu$ has i) No solution   ii) Unique solution   iii) Infinite number of solution. **(06 Marks)**

   b. Reduce the matrix $A = \begin{bmatrix} 4 & 3 \\ 2 & 9 \end{bmatrix}$ into the diagonal form. **(07 Marks)**

   c. Solve the system of equations $83x + 11y - 4z = 95$, $7x + 52y + 13z = 104$, $3x + 8y + 29z = 71$ by Gauss Seidal method (carry out 4 iteration). **(07 Marks)**

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18MAT21

Second Semester B.E. Degree Examination, Jan./Feb. 2021
Advanced Calculus and Numerical Methods

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. In which direction the directional derivative of x^2yz^3 is maximum at (2, 1, -1) and find the magnitude of this maximum. **(06 Marks)**

b. Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at (2, -1, 2). **(07 Marks)**

c. Show that $\vec{F} = (y+z)i + (z+x)j + (x+y)k$ is irrotational. Also find a scalar function ϕ such that $\vec{F} = \nabla\phi$. **(07 Marks)**

OR

2 a. Evaluate $\int_C \vec{F}.\overrightarrow{dr}$ where $\vec{F} = xyi + (x^2 + y^2)j$ along the path of the straight line from (0, 0) to (1, 0) and then to (1, 1). **(06 Marks)**

b. Verify Green's theorem in a plane for $\int(3x^2 - 8y^2)dx + (4y - 6xy)dy$ where C is the boundary of the region enclosed by $y = \sqrt{x}$ and $y = x^2$. **(07 Marks)**

c. Verify stoke's theorem for vector,
$\vec{F} = (x^2 + y^2)i - 2xyj$ taken round the rectangle bounded by $x = 0$, $x = a$, $y = 0$, $y = b$. **(07 Marks)**

Module-2

3 a. Solve : $(4D^4 - 8D^3 - 7D^2 + 11D + 6)y = 0$. **(06 Marks)**

b. Solve : $\dfrac{d^2y}{dx^2} - 4y = \cosh(2x - 1) + 3^x$. **(07 Marks)**

c. Solve : $\dfrac{d^3y}{dx^3} + \dfrac{d^2y}{dx^2} + 4\dfrac{dy}{dx} + 4y = x^2 - 4x - 6$. **(07 Marks)**

OR

4 a. Solve : $\dfrac{d^2y}{dx^2} + y = \tan x$ by the method of variation of parameters. **(06 Marks)**

b. Solve : $x^2y'' + xy' + 9y = 3x^2 + \sin(3\log x)$. **(07 Marks)**

c. The differential equation of a simple pendulum is $\dfrac{d^2x}{dt^2} + w^2x = F\sin xt$, where w and F are constants. If at $t = 0$, $x = 0$ and $\dfrac{dx}{dt} = 0$, determine the motion when $x = w$. **(07 Marks)**

Module-3

5 a. Find the P.D.E. of the family of all spheres whose centres lie on the plane z = 0 and have a constant radius 'r'. **(06 Marks)**

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

    c. Find all possible solutions of one dimensional heat equations, $\dfrac{\partial u}{\partial t} = C^2 \dfrac{\partial^2 u}{\partial x^2}$ using the method of separation of variables. **(07 Marks)**

OR

6 a. Solve : $\dfrac{\partial^2 z}{\partial x^2} + 3\dfrac{\partial z}{\partial x} - 4z = 0$ subject to the conditions that z = 1 and $\dfrac{\partial z}{\partial x} = y$ when x = 0. **(06 Marks)**

    b. Solve : $(y - z)p + (z - x)q = (x - y)$. **(07 Marks)**

    c. Derive one dimensional wave equation in the standard form as, $\dfrac{\partial^2 u}{\partial t^2} = C^2 \dfrac{\partial^2 u}{\partial x^2}$. **(07 Marks)**

Module-4

7 a. Discuss the nature of the series, $\dfrac{2}{3} + \dfrac{2.3}{3.5} + \dfrac{2.3.4}{3.5.7} + \ldots$ **(06 Marks)**

    b. Prove that $J_{-\frac{1}{2}}(x) = \sqrt{\dfrac{2}{\pi x}} \cdot \cos x$ **(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)**

OR

8 a. Discuss the nature of the series, $\displaystyle\sum_{n=1}^{\infty} \dfrac{(n+1)^n \cdot x^n}{n^{n+1}}$ **(06 Marks)**

    b. If α and β are two distinct roots of $J_n(x) = 0$, prove that $\displaystyle\int_0^1 xJ_n(\alpha x).J_n(\beta x)dx = \dfrac{1}{2}[J_n'(\alpha)]^2$ if $\alpha = \beta$. **(07 Marks)**

    c. Using Redrigue's formula obtain expressions for $P_0(x)$, $P_1(x)$, $P_2(x)$, $P_3(x)$, $P_4(x)$. **(07 Marks)**

Module-5

9 a. The Area of a circle (A) corresponding to diameter (D) is given below:

D	80	85	90	95	100
A	5026	5674	6362	7088	7854

Find the Area corresponding to diameter 105 using an appropriate interpolation formula. **(06 Marks)**

    b. Find the cubic polynomial which passes through the points (2, 4), (4, 56), (9, 711), (10, 980) by using Newton's divided difference formula. **(07 Marks)**

    c. Find the real root of the equation, $x \sin x + \cos x = 0$ near $x = \pi$ using Newton's Raphson method. Carry out three iterations. **(07 Marks)**

OR

10 a. The following table gives the normal weights of babies during first eight months of life.

Age (in months)	0	2	5	8
Weight (in pounds)	6	10	12	16

Estimate the weight of the baby at the age of seven months using Lagrange's interpolation formula.   **(06 Marks)**

b. Find the real root of $x \log_{10} x - 1.2 = 0$ by correct to four decimal places using Regula-Falsi method.   **(07 Marks)**

c. Use Simpson's $\frac{3}{8}^{th}$ rule to obtain the approximate value of $\int_{0}^{0.3} (1 - 8x^3)^{\frac{1}{2}} dx$ by considering 3 equal intervals.   **(07 Marks)**

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CBCS SCHEME

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First/Second Semester B.E. Degree Examination, Jan./Feb. 2021
Engineering Physics

Time: 3 hrs.   Max. Marks: 100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. Physical constants $h = 6.63 \times 10^{-34}$ JS ; $C = 3 \times 10^{8} ms^{-1}$; $\epsilon_O = 8.854 \times 10^{-12}$ F m^{-1}.
$K = 1.38 \times 10^{-23}$ J/K ; $N_A = 6.02 \times 10^{26}$/K mole ; $m_e = 9.1 \times 10^{-31}$ kg ; $e = 1.6 \times 10^{-19}C$;
$g = 9.81$ m/s ; $\mu_O = 4\pi \times 10^{-7}$ H/m.

Module-1

1   a. Derive an expression for equivalent force constant for two springs in series. What is the expression for period of its oscillation?   **(08 Marks)**
    b. Distinguish between ultrasonic, subsonic, supersonic and hypersonic waves. Define Mach number and Mach Angle.   **(08 Marks)**
    c. Evaluate the natural frequency of a spring of force constant 1974 N/m, carrying a mass of 2kg.   **(04 Marks)**

OR

2   a. What are damped oscillations? Give the theory of damped vibrations and find the condition for critical damping.   **(10 Marks)**
    b. Describe the construction and working of Reddy's shock tube with the help of a neat sketch.
                                                                                           (06 Marks)
    c. A vibrating system of natural frequency 500Hz is forced to vibrate with a periodic force per unit mass of amplitude 100×10^{-5} N/kg in the pressure of a damping/unit mass of 0.01×10^{-3} rad/s. Calculate the maximum amplitude of vibration of the system.   **(04 Marks)**

Module-2

3   a. Define different moduli of elasticity. Derive an expression for couple per unit twist of a solid cylinder fixed at one end and the couple being applied at the other end. **(10 Marks)**
    b. Show that for an elastic body, shear strain is equal to the sum of longitudinal strain and compressional strain.   **(06 Marks)**
    c. In a stretching experiment, the extension produced in a wire for a load of 1.5kg is 0.2×10^{-2}m. The length of the wire is 2m and its radius is 0.013×10^{-2}m . Find the Young's modulus of the material of the wire.   **(04 Marks)**

OR

4   a. Derive an expression for the Young's modulus of the material of a single cantilever in terms of depression at the free end.   **(08 Marks)**
    b. Show the relationship between Bulk modulus (K), Young's modulus (Y) and Poisson's Ratio (σ).   **(08 Marks)**
    c. Calculate the angular twist of a wire of length 0.3m and radius 0.2×10^{-3}m when a torque of 5×10^{-4}Nm is applied. Rigidity modulus of the material is 8×10^{10} N/m^2.   **(04 Marks)**

Module-3

5   a. Describe the vector operator ∇ and explain the concepts of divergence and curl with physical significance.   **(08 Marks)**
    b. Explain the attenuation in an optical fibre? Discuss any three factors contributing to the fibre loss.   **(08 Marks)**

c. Calculate the number of modes that can propagate inside an optical fibre with the data given below :

Refractive index of core	=	1.53
Refractive index cladding	=	1.50
Core radius	=	50 μm
Wavelength of light propagating through the optical fiber	=	1 μm

(04 Marks)

OR

6 a. With the help of a block diagram, explain the basics of point – to – point communication system using optical fibre. Mention any two advantages of optical communication system.

(08 Marks)

b. State and obtain Faraday's law of electromagnetic induction in differential form. (08 Marks)

c. Find the divergence of the vector field $\vec{A}$ given by $\vec{A} = 3x^2 \hat{a}_x + \frac{1}{2} y^2 z \hat{a}_y + 3xy \hat{a}_z$. (04 Marks)

Module-4

7 a. Set up Schrödinger's Time independent wave equation in one dimension. (08 Marks)

b. Explain the construction and working of semiconductor laser with the help of necessary neat diagram. (08 Marks)

c. The inherent uncertainity in the measurement of time spent by a nuclei in the excited state is 1.4×10^{-10}s. Calculate the uncertainity that results in its energy in the excited state.

(04 Marks)

OR

8 a. Show that electron cannot exist inside the nucleus of an atom. (08 Marks)

b. Derive an expression for energy density at thermal equilibrium in terms of Eienstein's co-efficient (08 Marks)

c. The ratio of population of two energy levels is 1.059×10^{-30}. Find the wavelength of light emitted by spontaneous emission at 330K. (04 Marks)

Module-5

9 a. Derive an expression for electrical conductivity of an intrinsic semiconductor. (08 Marks)

b. Define internal field and obtain the Clausius – Mossotti equation and different polarization mechanisms. (08 Marks)

c. Calculate the probability of an electron occupying an energy level 0.02eV above the Fermi level at 200K and 400K in a material. (04 Marks)

OR

10 a. Define Fermi energy and Fermi factor. Explain the dependence of Fermi factor on temperature and energy. (08 Marks)

b. Derive an expression for Hall coefficient and Hall voltage. (08 Marks)

c. Find the polarization produced in a dielectric medium of relative permittivity 15 in presence of an electric field of strength 500V/m. (04 Marks)

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First/Second Semester B.E. Degree Examination, Jan./Feb. 2021
Engineering Chemistry

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is single electrode potential? Derive Nernst equation for single electrode potential.
(07 Marks)

   b. What are electrolyte concentration cells? Calculate the cell potential of the following call at 298 K.
   $Ag \mid AgNO_3(0.005M) \parallel AgNO_3(0.5M) \mid Ag$
(06 Marks)

   c. Explain the construction and working of Ni-MH battery. Mention its applications. **(07 Marks)**

OR

2 a. What are primary, secondary and reserve batteries? Explain with examples. **(06 Marks)**

   b. Explain the construction and working of Li-ion battery. Mention its applications. **(07 Marks)**

   c. What is glass electrode? Explain the determination of pH using glass electrode. **(07 Marks)**

Module-2

3 a. Define metallic corrosion. Explain the electrochemical theory of corrosion taking iron as an example. **(07 Marks)**

   b. Explain : (i) Waterline corrosion and
               (ii) Galvanic corrosion.
(06 Marks)

   c. What is electroplating? Explain the electroplating of chromium. **(07 Marks)**

OR

4 a. What is metal finishing? Mention any five technological importance of metal finishing.
(06 Marks)

   b. What is electroless plating? Explain the electroless plating of copper with relevant reactions.
(07 Marks)

   c. What is cathodic protection? Explain (i) Sacrificial anode   (ii) Impressed current methods
(07 Marks)

Module-3

5 a. Define gross calorific and net calorific of a fuel. Calculate GCV and NCV of a sample of a coal from the following data:
   Mass of fuel taken = 0.75 g,
   Mass of water in the copper calorimeter = 2.5 kg
   Water equivalent of calorimeter = 0.485 kg
   Increase in temperature of water = 4°C
   Specific heat of water = 4.187 kJ/kg/°C
   Latent heat of steam = 587 × 4.187 KJ/kg
   Percentage of hydrogen in fuel sample = 2.5
(07 Marks)

   b. What are fuel cells? Describe the construction and working of Methanol-oxygen fuel cell.
(07 Marks)

   c. What are PV cells? Mention their advantages and limitations. **(06 Marks)**

OR

6 a. What is knocking? Explain its mechanism. (06 Marks)
   b. What is chemical fuel? Explain the experimental determination of calorific value of solid / liquid fuel using Bomb calorimeter. (07 Marks)
   c. Explain the preparation of Solar grade silicon by union carbide process. (07 Marks)

Module-4

7 a. What is desalination of water? Describe the process of reverse osmosis of sea water. (07 Marks)
   b. In a COD test 30.2 cm^3 and 14.5 cm^3 of 0.05 N FAS solution are required for blank and sample titration respectively. The volume of the test sample used was 25 cm^3. Calculate the COD of the sample solution. (06 Marks)
   c. Mention the sources of sulphur dioxide pollution. Write down its ill effects and control measure. (07 Marks)

OR

8 a. Explain the activated sludge treatment and sewage water. (06 Marks)
   b. What are the sources, effects and control of lead pollution? (07 Marks)
   c. What are the causes, effects and disposal methods of e-waste? (07 Marks)

Module-5

9 a. Explain the theory, instrumentation and application of conductometry. (07 Marks)
   b. Explain the theory and instrumentation of potentiometry. (07 Marks)
   c. Explain the synthesis of nanomaterial by sol-gel technique. (06 Marks)

OR

10 a. What are nanomaterials? Explain the synthesis of nanomaterials by precipitation method. (07 Marks)
    b. What are fullerenes? Write any four applications of fullerenes. (06 Marks)
    c. Explain the theory and instrumentation of colorimetry. (07 Marks)

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐   18CPS13/23

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

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1   a. Describe the various types of computers.   **(10 Marks)**
    b. What is a printer? Explain the different types of printers.   **(08 Marks)**
    c. Define software. Name the different types of software.   **(02 Marks)**

OR

2   a. Define operators. Illustrate all the operators used in C language.   **(10 Marks)**
    b. Write a C program to find the eligibility for voting. Draw the flow chart for the same.
                                                                                    (10 Marks)

Module-2

3   a. Differentiate between entry control loop and exit control loop. Explain with syntax and example.   **(10 Marks)**
    b. Develop a C program to find the reverse of a positive integer and check for palindrome or not. Display appropriate message.   **(08 Marks)**
    c. Explain with syntax, flowchart simple IF statement.   **(02 Marks)**

OR

4   a. Why conditional branching statements are needed in C program? Illustrate 5 types of branching statements in C program.   **(10 Marks)**
    b. Write a C program to plot Pascal's triangle.   **(08 Marks)**
    c. Explain loop control statement in C program.   **(02 Marks)**

Module-3

5   a. Define string. List all string manipulation functions. Explain any two with examples.
                                                                                    (10 Marks)
    b. Write a C program to count vowels and consonants in a string.   **(08 Marks)**
    c. Explain I/O functions for strings.   **(02 Marks)**

OR

6   a. Define array. Write the syntax for declaring and initializing 1D and 2D array with suitable example.   **(10 Marks)**
    b. Write a C program to find sum of diagonal elements of matrix.   **(05 Marks)**
    c. Write a C program to sort the numbers in ascending order using selection sort technique.
                                                                                    (05 Marks)

Module-4

7   a. What is a function? Explain the different types of functions based on parameter. **(10 Marks)**
    b. Explain recursions. Write a program to find factorial of a given number using recursive function.   **(10 Marks)**

OR

8 a. Write recursive functions for converting binary number to decimal number. (10 Marks)
   b. Write a program to sort n numbers using bubble sort technique and using iterative function. (10 Marks)

Module-5

9 a. Differentiate between structure and array. Explain the syntax of structure declaration in C with example. (08 Marks)
   b. Implement structure to read and write Book_title, Book_author and Book_id for N books. (06 Marks)
   c. Illustrate on :
       i) Arrays within structures
       ii) Arrays of structure. (06 Marks)

OR

10 a. What is a preprocessor? Explain types of preprocessor directives. (10 Marks)
   b. Develop a program using pointers to compute the sum and average of all elements in an array. (10 Marks)

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ 18ELE13/23

First/Second Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. State and explain Kirchhoff's laws. **(06 Marks)**
   b. Define RMS value of an alternating quantity. Obtain an expression for it in terms of maximum value. **(06 Marks)**
   c. Find : i) Current in 15Ω resistor ii) Voltage across 18Ω resistor iii) Power dissipated in 7Ω resistor as shown in circuit diagram. Fig.Q1(c).
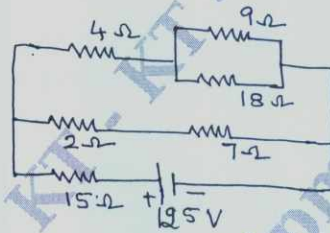

Fig.Q1(c) **(08 Marks)**

OR

2 a. Define average value of a sinusoidally varying current and find its relation with its maximum value. **(06 Marks)**
   b. State ohm's law and mention its limitations. **(06 Marks)**
   c. For the current waveform shown in Fig.Q2(c).
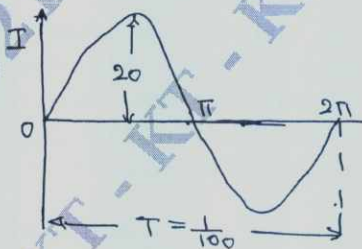   Find : i) Peak current ii) Average value iii) Periodic time iv) Frequency v) Instantaneous Value at t = 3ms.

Fig.Q2(c) **(08 Marks)**

Module-2

3 a. Show that pure inductance does not consume any power. Draw the wave forms of voltage, current and power. When an alternating voltage is applied to a pure inductance. **(06 Marks)**
   b. In a three phase delta connection, find the relation between line and phase values of currents and voltages. Also derive the equation for three phase power. **(06 Marks)**
   c. A series R-L-C circuit is composed of a 100 ohms resistance, 1H inductance and 5μF capacitance. A voltage of V(t) = 141.4 cos 377t volts is applied to the circuit. Determine the current and voltages V_R, V_L and V_C. **(08 Marks)**

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OR

4 a. Derive an equation for the power consumed by an R – L series circuit. Draw the wave form of voltage, current and power. **(06 Marks)**

   b. When a three phase balanced impedances are connected in star, across a 3 phase 415V, 50Hz supply, the line current drawn is 20A, at a lagging p.f of 0.4. Determine the parameters of the impedance in each phase. **(06 Marks)**

   c. Show that two wattmetres are sufficient to measure power in a 3-phase balanced star connected circuit with the aid of neat circuit diagram and phasor diagrams. **(08 Marks)**

Module-3

5 a. Give the constructional details of core type and shell type of transformer. **(06 Marks)**

   b. Derive the condition for which the efficiency of a transformer is maximum. **(06 Marks)**

   c. With a circuit diagram, explain the working of a two-way and three way control of lamp. **(08 Marks)**

OR

6 a. With a neat figure, explain pipe earthing. **(06 Marks)**

   b. What are the various loses that occur in a transformer? Give the equations for these loses. **(06 Marks)**

   c. A single phase transformer working at 0.8p.f has an efficiency of 94% at both three-fourth full load and full load of 600Kw. Determine the efficiency at half full load, unity power factor. **(08 Marks)**

Module-4

7 a. Derive the EMF equation of a DC generator. **(06 Marks)**

   b. What is back emf in a DC motor? What is its significance? **(06 Marks)**

   c. A 4 pole, DC shunt generator with lap connected armature has field and armature resistance of 50Ω and 0.1Ω respectively, if the generator supplies sixty 100V, 40W lamps, calculate the total armature current, the current in each armature conductor and the generated EMF. Take 1V per brush as contact drop. **(08 Marks)**

OR

8 a. Derive an equation for the torque developed in the armature of a DC motor. **(06 Marks)**

   b. Sketch Ta V/S I_a and N V/S I_a characteristics of : i) Shunt motor ii) Series motor
       Mention two applications of each motor. **(06 Marks)**

   c. A 4pole, 220V lap connected DC shunt motor has 36 slots, each slot containing 16 conductors it draws a current of 40A form the supply. The field resistance and armature resistances are 110Ω and 0.1Ω respectively. The motor develops an output power of 6KW. The flux per pole is 40m Wb. Calculate :
       i) The speed   ii) The torque developed by the armature iii) The shaft torque. **(08 Marks)**

Module-5

9 a. Derive the emf equation of an synchronous generator. **(06 Marks)**

   b. Define slip of an induction motor and derive expression for frequency of rotor current. **(06 Marks)**

   c. With neat sketches explain the construction of two types of synchronous generator. **(08 Marks)**

OR

10 a. Explain clearly the working principle of a three phase induction motor. **(06 Marks)**

    b. A 6pole, 3 phase star connected alternator has an armature with 90 slots and 12 conductor per slot. It revolves at 1000 rpm, the flux per pole being 0.5 Wb. Calculate the emf generated if the winding factor is 0.97 and all the conductors in each phase are in series the coil is full pitched. **(06 Marks)**

    c. Explain the concept of rotating magnetic field in case of a 3 phase induction motor. **(08 Marks)**

* * * 2 of 2 * * *

CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐

18ELN14/24

First/Second Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Electronics

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain the operation of p-n junction diode under forward and reverse biased condition. **(08 Marks)**

   b. Write a short note on :
   i)   Light emitting diode
   ii) Photo coupler. **(06 Marks)**

   c. Explain the operation of 7805 fixed IC voltage regulator. **(06 Marks)**

OR

2 a. With neat circuit diagram and waveform explain the working of a centre tapped full wave rectifier. **(08 Marks)**

   b. Explain briefly the operation of a capacitor filter circuit. **(06 Marks)**

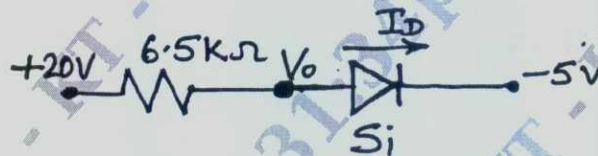   c. For the diode circuit shown in Fig.Q2(c), determine V_0 and I_D.

Fig.Q2(c) **(06 Marks)**

Module-2

3 a. Explain the characteristics of N-channel JFET. **(08 Marks)**

   b. With neat circuit diagram, explain the working of CMOS inverter. **(08 Marks)**

   c. A certain JFET has an I_{GSS} of $-2nA$ for $V_{GS} = -20V$. Determine the input resistance. **(04 Marks)**

OR

4 a. Draw and explain the operations of SCR using 2 – transistor equivalent circuit. **(08 Marks)**

   b. Explain phase controlled application of SCR. **(06 Marks)**

   c. Explain the construction and working of P – channel enhancement type MOSFET. **(06 Marks)**

Module-3

5 a. For an op-amp :
   i)   List the characteristics of an ideal ap-amp
   ii) Draw the three input inverting summer circuit and derive the expression for its output voltage. **(08 Marks)**

   b. Define the terms :
   i)   Slew rate
   ii) CMRR
   iii) Common mode gain AC of op-amp. **(06 Marks)**

   c. Design an adder circuit using an op-amp to obtain an output voltage of $-[2V_1 + 3V_2 + 5V_3]$. **(06 Marks)**

OR

6 a. Derive an expression for the output voltage of a non-inverting amplifier. (06 Marks)
   b. With a neat diagram, explain how an op-amp can be used as a integrator. (06 Marks)
   c. A non-inverting amplifier circuit has an input resistance of $10K\Omega$ and feedback resistance 60Ω with load resistance of $47K\Omega$. Draw the circuit. Calculate the output voltage, voltage gain, load current when the input voltage is 1.5V. (08 Marks)

Module-4

7 a. Briefly explain how a transistor used as an electronic switch. (06 Marks)
   b. Explain how 555 timer can be used as an oscillator. (06 Marks)
   c. Define an oscillator. Derive the equation for Wien bridge oscillator. (08 Marks)

OR

8 a. Explain the Barkhausens criteria for oscillations. (06 Marks)
   b. Draw and explain the operation of a voltage series feedback amplifier and derive an expression for its voltage gain with feedback. (06 Marks)
   c. Explain the operation of an RC phase shift oscillator. (08 Marks)

Module-5

9 a. Convert the following :
   i) $(867)_{10} = (?)_2 = (?)_{16}$
   ii) $(110111101.01)_2 = (?)_{10} = (?)_{16}$. (08 Marks)

   b. Simplify the following expressions and draw the logic circuit using basic gates.
   i) $Y = \overline{AB} + \overline{AC} + A\overline{B}\,\overline{C} + \overline{(AB + C)}$

   ii) $Y = A(\overline{\overline{ABC} + A\overline{B}C})$. (06 Marks)

   c. Realize a full adder circuit using 2 half adders. (06 Marks)

OR

10 a. Perform the following :
   i) Convert $(ABCD)_{16} = (?)_2 = (?)_8$
   ii) Convert $(4477.85)_{10} = (?)_{16} = (?)_8$. (08 Marks)

   b. Draw and explain 4-bit shift register. (06 Marks)
   c. With a neat block diagram, explain the working of a communication system. (06 Marks)

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USN ☐☐☐☐☐☐☐☐☐☐

18CIV14/24

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

Time: 3 hrs.

Max. Marks: 100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. Missing data, if any, may be suitably assumed.

Module-1

1 a. Explain briefly the scope of following areas of civil engineering :
   i) Irrigation engineering
   ii) Environmental engineering. **(10 Marks)**

   b. What are the roles of civil engineers in the infrastructural development of a country? **(10 Marks)**

OR

2 a. State and explain basic idealization in mechanics. **(06 Marks)**
   b. State and prove law of parallelogram of forces. **(06 Marks)**
   c. Two forces acting on a body are 500N and 1000N as shown in Fig.Q2(c). Determine the third force F such that the resultant of all the three forces is 1000N, directed at 40° to the X axis.

Fig.Q2(c) **(08 Marks)**
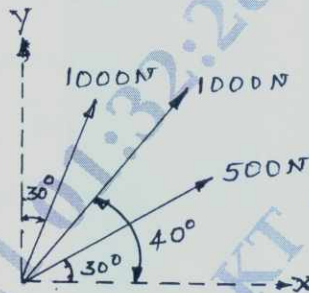
Module-2

3 a. State and prove Lami's theorem. **(08 Marks)**
   b. Two identical cylinders, each weighing 500N are arranged in a through as shown in Fig.Q3(b). Determine the reactions developed at contact points A, B, C and D. Assume all points of contact are smooth.
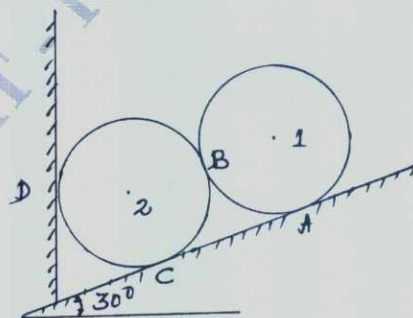
Fig.Q3(b) **(10 Marks)**

   c. List the equations of equilibrium. **(02 Marks)**

OR

4 a. State the laws of dry friction. **(04 Marks)**
   b. Explain the types of friction. **(06 Marks)**
   c. Find the force p just required to slide the block B in the arrangement shown in Fig.Q4(c). Find also the tension in the string. Given weight of block A = 500N and weight of block B = 1000N. μ = 0.2 for all contact surfaces.
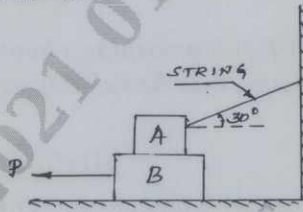
Fig.Q4(c) **(10 Marks)**

Module-3

5 a. Explain with sketches different types of loads. **(04 Marks)**
   b. Explain with sketches different types of supports. **(06 Marks)**
   c. Determine the reactions developed at supports A and B of overhanging beam shown in Fig.Q5(c).
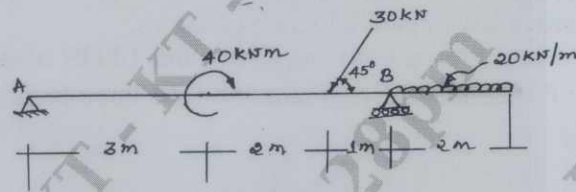
Fig.Q5(c) **(10 Marks)**

OR

6 a. List the different types of trusses. **(06 Marks)**
   b. Analyse the truss shown in Fig.Q6(b) by method of joints.
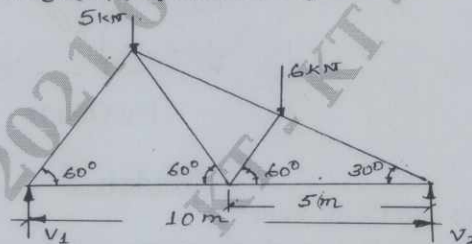
Fig.Q6(b) **(14 Marks)**

Module-4

7 a. Determine the centroid of a semicircular lamina from the first principle. **(08 Marks)**
   b. Locate the centroid of the lamina shown in Fig.Q7(b), with respect to axes 1 – 1 and 2 – 2.
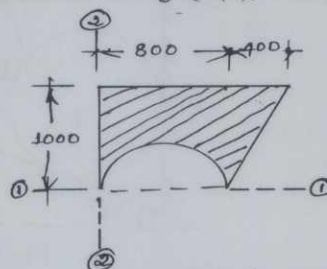
Fig.Q7(b) **(12 Marks)**

OR

8 a. State and prove parallel axes theorem. (08 Marks)

   b. Determine the moment of inertia of the symmetric I-section shown in Fig.Q8(b) about its centroidal axes x-x ad y-y.
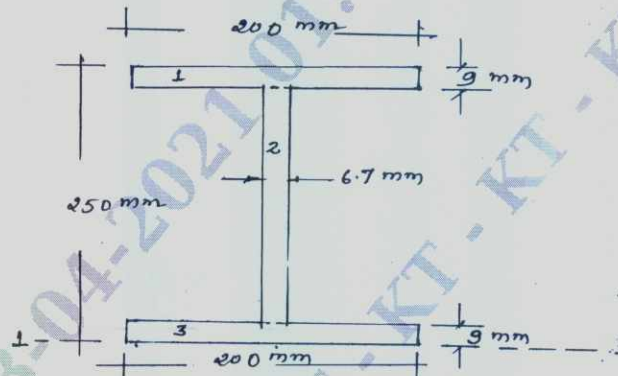
Fig.Q8(b) (12 Marks)

Module-5

9 a. Define the following :
   i) Projectile
   ii) Trajectory
   iii) Time of flight
   iv) Range. (08 Marks)

   b. A projectile is fired at certain angle has a horizontal range of 3.5km. If the maximum height reached is 500m, what is the angle of elevation of the cannon? What was the muzzle velocity of the projectile? (06 Marks)

   c. A Burglar's car starts with an acceleration of 2m/sec². A police van came after 10 sec and continued to chase the burglar's car with an uniform velocity of 40m/sec. find the time taken by the police van to overtake the Burglar's car. (06 Marks)

OR

10 a. State Newton's second law of motion and D'Alembert's principle. (04 Marks)

   b. A lift carries a man of weight 4000kN and is moving with a uniform acceleration of 3.5m/sec². Determine the tension in the cable when :
   i) Lift is moving upwards
   ii) Lift is moving downwards. (08 Marks)

   c. A car travelling at a speed of 75kmph applies brake and comes to a halt after skidding 60m. Determine :
   i) Deceleration
   ii) Time to stop the car
   iii) Coefficient of friction between road and tyres. (08 Marks)

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18EGH28

USN ☐☐☐☐☐☐☐☐☐☐ | Question Paper Version : **D**

Second Semester B.E Degree Examination, Jan./Feb. 2021
Technical English – II
(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 correct reported speech. (Q.No.1 to Q.No.2)

1. Ravi said, "I speak English."
   a) Ravi said that she spoke English.
   b) Ravi said that he spoke English.
   c) Ravi said that he speaks English.
   d) None of these

2. The Boss said, "Arrest them".
   a) The Boss ordered to arrest them.
   b) The Boss requested to arrest them.
   c) The Boss informed to arrest them.
   d) None of these

Find the correct analogy. (Q.No.3 to Q.No.5)

3. Broad : Narrow : : ? : Specific
   a) General   b) Broad   c) Narrow   d) None of these

4. Mother : Father : : Aunt : Uncle
   a) Element   b) Relationship   c) Extension   d) None of these

5. Doctor : Nurse : : ? : Follower
   a) employer   b) leader   c) worker   d) manager

Change the voice: (Q.No. 6 and Q.No. 7)

6. Manners show character.
   a) Character shows manner.   b) Character is shown by manners
   c) Character was shown by manners.   d) None of these

7. Stanley produced a film.
   a) A film is produced by Stanley.   b) A film was produced by Stanley.
   c) A film is being produced by Stanley.   d) None of these

Find the correct use of articles. (Q.No.8 to Q.No.11)

8. _____ iron is a useful metal.
   a) a   b) an   c) the   d) no article

9. He is _____ best player in the team.
   a) a   b) an   c) the   d) none of these

10. I live in _____ Mumbai.
    a) a   b) an   c) the   d) none of these

11. _____ humanity is in danger.
    a) a   b) an   c) the   d) no article

Fill in the blanks with the right answer.

12. How many parts does the body of the letter consists of ?
    a) 2   b) 1   c) 3   d) 4

13. If a business letter is written in a letter head, where the sender's address should be there?
    a) Right   b) Left   c) Middle   d) None of these

14. _____ is a greeting to the person to whom you are writing. (Hello, how do you do)
    a) Salutation   b) Closing note   c) Body   d) None of these

15. In _____ letter you write reason for resigning, your association with organization, growth and development etc.
    a) letters of resignation   b) resume
    c) request   d) recommendations

16. _____ is a system used for creating, sending and storing textual data.
    a) E-mail   b) Blog   c) Report   d) None of these

17. _____ is called as electronic mail.
    a) Blog   b) E-mail   c) Resume   d) None of these

18. The act of breaking in computer security is termed as _____.
    a) Misinterpretation   b) Lengthy mails   c) Hacking   d) None of these

19. _____ is the one who receives the mail.
   a) Creator   b) Sender   c) Recipient   d) None of these

20. _____ is intended to test the readers ability to understand, interpret and analyze text on different topic and his own range and vocabulary building.
   a) E-mail   b) Reading   c) Report   d) None of these

21. _____ is just going through the material and getting the information.
   a) Reading   b) Scanning   c) Skimming   d) Writing

22. _____ is a detailed accurate reading.
   a) Extensive reading   b) Intensive reading   c) Skimming   d) None of these

23. A _____ is a type of interaction, oral communication which takes place when a group of people get together to discuss something.
   a) Interview   b) Group discussion   c) Body language   d) None of these

24. There are _____ types of group discussions.
   a) 1   b) 2   c) 3   d) 4

25. Give an example of controversial.
   a) reservation   b) traffic   c) yoga   d) dance

26. _____ is given for discussion mainly to evaluate the candidate's certainity and imaginative faculty.
   a) Case   b) Abstract   c) Controversial   d) Factual

27. In discussion members of a group must display an _____ understanding of various issues.
   a) effective   b) indepth   c) friendly   d) equal participation

28. _____ is not always possible to arrive at clear cut conclusion but there must be sensuous efforts to conclude.
   a) Initiation   b) Arriving at a broad sensus
   c) Conclusion   d) None of these

29. _____ includes eye contact, facial expression, gestures, postures etc.
   a) Body language   b) Knowledge of topic
   c) Interpersonal skills   d) None of these

30. Who takes up the initiation and start, give direction to discussion?
   a) Common person   b) Leader   c) Evaluator   d) Teacher

31. _____ can project successfully unless we know our strengths and weakness properly.
   a) Background   b) Accomplishments c) Self analysis   d) Achievements

32. In _____ many people get nervous at the very idea of job interview.
   a) Interview   b) Seminar   c) Presentation   d) Group discussion

33. In _____ there are long term and short term goals.
    a) analyse your skills   b) skills
    c) analyse your career goals   d) none of these

34. _____ includes scholarship awards, certificate etc.
    a) Accomplishments   b) Achievements
    c) Analysis   d) Background knowledge

35. How many types of skills are there in interview skills?
    a) 1   b) 2   c) 3   d) 4

36. _____ is a part of one's personality.
    a) Learned skills   b) Career goals   c) Analyse your skills   d) Intuitive skills

37. Imagination is a _____ skill.
    a) learned skills   b) career   c) intuitive   d) none of these

38. What is the common cause of ineffective presentation?
    a) failure to motivate the audience   b) good communication
    c) interview   d) none of these

39. _____ is a non-verbal communication involving body movement.
    a) Interview   b) Body language   c) Presentation   d) None of these

40. _____ is comfortable for three seconds.
    a) Facial expression   b) Space   c) Eye contact   d) None of these

41. Smile is a type of _____.
    a) communication   b) conversation   c) talk   d) none of these

42. Interpersonal skills lead to personality development and later to _____ skills.
    a) leadership skills   b) interview   c) extramural   d) none of these

43. _____ is the process of sending the message from the receiver to the sender.
    a) Channel   b) Transparency   c) Feedback   d) None of these

44. Where do you write sender's address in formal letters?
    a) Right side   b) Left   c) Middle   d) None of these

45. Readers are of _____ types.
    a) 1   b) 2   c) 3   d) 4

46. _____ is also known as web blog.
    a) Blog   b) Welog   c) E-mail   d) None of these

47. E-mail is _____.
    a) Expensive   b) Very expensive   c) Inexpensive   d) None of these

48. P.S. full form is
    a) Post Script   b) Post Sim   c) Postpone   d) None of these

49. In which order do we write the educational qualification in resume?
a) Highest to lowest
b) Lowest to highest
c) Any order
d) None of these

50. Are achievements and accomplishments same?
a) Yes
b) No
c) Both
d) None of these

51. _____ is called as summary of employment history.
a) Blog
b) Resume
c) Reading
d) None of these

52. _____ is a person who composes E-mail.
a) Sender
b) Recipient
c) Recipient mail agent
d) None of these

53. In which letter do we use yours lovingly?
a) Personal
b) Formal
c) Business
d) None of these

54. Is it right to write an E-mail in capital letters?
a) Yes
b) No
c) OK
d) None of these

55. In which order do you write the experience in resume?
a) Current experience first
b) First experience first
c) Any order
d) None of these

56. _____ is an abstract or summary. Its writing is a well planned document which evaluates a subject or problem.
a) Technical proposals
b) Collocation
c) Report
d) None of these

Select the correct gender of the underlined word: (Q.No.57 to Q.No.61)

57. My niece is a beautiful child.
a) masculine
b) feminine
c) neuter
d) common

58. My son is an intelligent boy.
a) masculine
b) feminine
c) neuter
d) common

59. She is the author of this book.
a) masculine
b) feminine
c) neuter
d) common

60. He is an actor from Hollywood.
a) masculine
b) feminine
c) neuter
d) common

61. A peacock was dancing on the lawn.
a) masculine
b) feminine
c) neuter
d) common

Identify the correct form of verb (Errors of Tense) (Q.No.62 to Q.No.66)

62. The adventures of Tom Sawyer _____ written by Twain.
    a) were   b) was   c) was being   d) are

63. I _____ to school every day.
    a) goes   b) go   c) going   d) went

64. Time and tide _____ for none.
    a) wait   b) waits   c) waiting   d) waited

65. We are _____ to Delhi.
    a) went   b) going   c) gone   d) none

66. Surekha was _____ to the broadcast.
    a) listen   b) listens   c) listening   d) listened

Use the right form of noun. (Q.No.67 to Q.No.75)

67. They have no _____.
    a) rupees   b) money   c) rupee   d) none of these

68. A group of fish is known as _____.
    a) choir   b) school   c) gang   d) pack

69. I have a torn fifty _____ note.
    a) rupees   b) rupee   c) money   d) none of these

70. The Afghani fellow has three _____.
    a) brothers-in-law   b) brother-in-law   c) brother-ins-law   d) none of these

71. _____ and Eve's children.
    a) Adam   b) Adam's   c) Adamses   d) None of these

72. I am a vegetarian and thankfully I love _____ and vegetables.
    a) fruit   b) fruit's   c) fruitses   d) none of these

73. Which one of the following word is an example of preposition?
    a) into   b) if   c) many   d) you

74. Which one of the following word is an example of an interjection?
    a) soon   b) when   c) ouch   d) within

75. Which one of the following word is an example of a conjunction?
    a) and   b) run   c) below   d) her

Select the appropriate verb. (Q.No.76 to Q.No.80)

76. Someone _____ left the luggage.
    a) have   b) had   c) has   d) none of these

77. One of the novelists _____ been nominated for the prize.
    a) have   b) had   c) has   d) none of these

78. The horse and carriage _____ ready.
    a) are   b) was   c) is   d) none of these

79. She told _____ an interesting story.
    a) to me   b) me   c) for me   d) none of these

80. He told me that honesty _____ the best policy.
    a) was   b) is   c) were   d) none of these

Use the right form of pronouns.

81. _____ went to the office.
    a) myself   b) I   c) mine   d) me

82. Let ____ go.
    a) me   b) I   c) mine   d) none of these

83. Jack and Peter dislike _____ another.
    a) oneself   b) themselves   c) one   d) each other

84. Each boy and each girl _____ given a book.
    a) were   b) was   c) are   d) is

85. The word Essay is derived from a Latin word.
    a) exam   b) ecstasy   c) exagium   d) none of these

86. _____ should summarise the whole essay.
    a) Introduction   b) Body   c) Main part   d) Conclusion

87. _____ essays are generally academic in nature and serious topic.
    a) Semiformal   b) Informal   c) Formal   d) None of these

88. _____ is used in phrases and sentences that express sudden, strong emotion or a wish.
    a) Interrogation   b) Exclamation   c) Capital   d) None of these

89. _____ are used by writers to indicate an after though by introducing some words, phrases or a clause.
    a) Apostrophe   b) Exclamation   c) Parentheses   d) None of these

90. Use the apostrophe in the sentence.
    The childrens books are lying there.
    a) books   b) children's   c) childrens's   d) none of these

Choose the correct adverb. (Q.No.91 to Q.No.95)

91. I am _____ sorry.
    a) very   b) much   c) many   d) quite

92. I know _____ swim.
    a) to   b) how   c) how to   d) none of these

93. The candidate performed _____.
   a) brilliance   b) brilliant   c) brilliantly   d) none of these

94. In the exam, I wrote the answers _____.
   a) quicker   b) quickest   c) quickly   d) quicken

95. He _____ studies, yet scores well.
   a) hard   b) harder   c) hardly   d) hardest

Select the correct meaning of the underlined Idiom: (Q.No.96 to Q.No.100)

96. Don't think this exam will be a piece of cake, study hard.
   a) hard   b) critical   c) easy   d) none of these

97. Don't beat around the bush, tell me frankly what you think of my proposition.
   a) To avoid coming to the point   b) Come to point
   c) Say exactly   d) None of these

98. Many startups turn in a profit once in a blue moon.
   a) scarcely   b) rarely   c) suitably   d) quietly.

99. The stockholders poured cold water on the plan to invest in a new venture.
   a) praise   b) silence   c) criticize   d) hush

100. If you try to cut corners during a manufacturing process, you stand to lose.
   a) save money   b) waste money
   c) discount   d) change the product

* * * * *