B.E. First Semester Examination – January 2019
Engineering Mathematics – I

Time: 3 hrs

Note: Answer any FIVE full questions, selecting at least ONE full question from each module.

Module – I

1. a) Find the \( n^{th} \) derivative of \( e^{3x} \cos 5x \sin 2x \).

   b) If \( y = a \cos (\log x) + b \sin (\log x) \), then prove that
   \[ x^2 y_{n+2} + (2n + 1)xy'_{n+1} + (n^2 + 1)y_n = 0 \]

   c) Prove that \( \tan \phi = \frac{r}{\frac{dr}{d\theta}} \) for the curve \( r = f(\theta) \).

   (06 Marks)

   (07 Marks)

   (07 Marks)

2. a) Find the pedal equation of the curve \( r^2 = a^2 \cos(2\theta) \).

   b) Prove that \( \rho = \frac{(r^2 + r_1^2)^{\frac{3}{2}}}{r^2 + 2rr_1 - r_1^2} \) for the curve \( r = f(\theta) \).

   c) Find the radius of curvature for the parabola \( y^2 = 4ax \) at the point \((a, 2a)\).

   (06 Marks)

   (07 Marks)

   (07 Marks)

Module – II

3. a) If \( u = f(x + ay) + g(x - ay) \) prove that \( \frac{\partial^2 u}{\partial y^2} = a^2 \frac{\partial^2 u}{\partial x^2} \).

   b) If \( u = \frac{x + y + z}{y} \) \( \frac{x}{z} \) \( \frac{y}{x} \) prove that \( x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 0 \).

   c) If \( u = \sin^{-1} \left( \frac{x^2 + y^2}{x + y} \right) \), find \( x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} \).

   (06 Marks)

   (07 Marks)

   (07 Marks)

4. a) If \( u = f(r, s, t) \) where \( r = x - y, s = y - z, t = z - x \) prove that \( \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0 \).

   b) If \( u = x + y + z, v = xy + yz + zx, w = x^2 + y^2 + z^2 \), find \( \frac{\partial (u, v, w)}{\partial (x, y, z)} \).

   c) Find the percentage error in the area of an ellipse \( A = \pi ab \) when an error 1% is made measuring the major and minor axis.

   (06 Marks)

   (07 Marks)

   (07 Marks)

Module – III

5. a) Prove that \( \int_0^\pi \sin^n(\theta) d\theta = \left( \frac{n-1}{n} \right) \left( \frac{n-3}{n-2} \right) \ldots \ldots \) \( \frac{\pi}{2} \) \( (n \text{ is even}) \)

   b) Evaluate \( \int_0^\pi x \sin^n x \cos^2 x \, dx \).

   c) Evaluate \( \int_0^1 \frac{x^2}{\sqrt{1-x^2}} \, dx \).

   (06 Marks)

   (07 Marks)

   (07 Marks)
6. a) Find the rank of matrix
\[
A = \begin{bmatrix}
1 & -1 & 2 & 3 \\
2 & 1 & -1 & 2 \\
1 & 2 & -3 & -1 \\
4 & 2 & 4 & 2
\end{bmatrix}
\] (06 Marks)

b) Solve the system of equation
\[
\begin{align*}
x + 2y + 3z &= 0 \\
2x - y + 2z &= 0 \\
3x + y + 5z &= 0
\end{align*}
\] (07 Marks)

c) Solve the system of equations by Gauss-Jordan method
\[
\begin{align*}
2x_1 + x_2 + 4x_3 &= 12 \\
4x_1 + 11x_2 - x_3 &= 33 \\
8x_1 - 3x_2 + 2x_3 &= 20
\end{align*}
\] (07 Marks)

7. a) Test for convergence
\[
\frac{1}{1.2} + \frac{2}{2.3} + \frac{3}{3.4} + \ldots \ldots
\] (06 Marks)

b) Find the nature of series \(\sqrt[4]{x} + \sqrt[3]{x^2} + \sqrt[5]{x^3} + \ldots\ldots\) (07 Marks)

c) Test the convergence of the series
\[
\sum_{n=1}^{\infty} \left(1 - \frac{1}{n}\right)^2
\] (07 Marks)

8. a) Trace the curve \(y^2 (2a-x) = x^3, a > 0\) (06 Marks)

b) Find the perimeter of the curve \(x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}\) (07 Marks)

c) Find the volume generated by revolving the curve \(y^2 = 4ax\) cut off by the latus rectum about x-axis. (07 Marks)

Module - V

9. a) Solve \(\frac{dy}{dx} = (4x + y + 1)^2\). (06 Marks)

b) Solve \(\frac{dy}{dx} = \frac{x^2 - y^2}{2xy}\). (07 Marks)

c) Solve \((x + 1) \frac{dy}{dx} - y = e^{3x} (x + 1)^2\). (07 Marks)

10. a) Solve \([y(1 + \frac{1}{x}) + \cos y]dx + [x + \log x - x \sin y] dy = 0\). (06 Marks)

b) Find the orthogonal trajectories of the family of curve, \(x^2 + y^2 = a^2\). (07 Marks)

c) Find the orthogonal trajectories for the curve \(r = 2a \cos \theta\). (07 Marks)
B.E. First Semester Examination – January 2019
Calculus and Linear Algebra

Time: 3 hrs]

Note: Answer any FIVE full questions, selecting at least TWO Full questions from each module.

Module - I

1. a) Find the angle between the radius vector and the tangent for the curve \( r = a(1 - \cos \theta) \). (06 Marks)
   
   b) Find the pedal equation of the curve \( r^2 = a^2 \sec 2\theta \). (07 Marks)
   
   c) Derive an expression for radius of curvature in Cartesian form \( \rho = \frac{(1 + y'^2)^{3/2}}{y''} \). (07 Marks)

2. a) Find the radius of curvature at the point \((x, y)\) of the curve \( y = c \cos h \left( \frac{x}{c} \right) \). (06 Marks)

   b) Expand the function in ascending powers of \( x \) by using the Maclaurin’s theorem \( f(x) = \log (1 + x) \). (07 Marks)

   c) Evaluate \( \int_{x \to a} \left( 2 - \frac{x}{a} \right) \tan \left( \frac{x}{2a} \right) dx \). (07 Marks)

Module - II

3. a) Prove that \( \beta(m, n) = \frac{\Gamma(m) \Gamma(n)}{\Gamma(m + n)} \). (06 Marks)

   b) Evaluate \( \int_{0}^{\pi} \sqrt{\cot \theta} \, d\theta \) by expressing in terms of gamma functions. (07 Marks)

   c) Express the integral in terms of beta function and hence evaluate \( \int_{0}^{2} \left( 4 - x^2 \right)^{3/2} \, dx \). (07 Marks)

4. a) Trace the curve \( y^2 (a - x) = x^3, \ a > 0 \). (06 Marks)

   b) Find the perimeter of the cardioid \( r = a(1 + \cos \theta) \). (07 Marks)

   c) Find the volume generated by the parabole \( y^2 = 4ax \) when revolved about the y-axis between \( y = 0 \) and \( y = 2a \). (07 Marks)

Module - III

5. a) Solve \( y (2xy + 1) \, dx - x \, dy = 0 \). (06 Marks)

   b) Solve \( \frac{dy}{dx} + y \cot (x) = \cos x \). (07 Marks)

   c) Show that the family of parabolas \( y^2 = 4a(x + a) \) is self orthogonal. (07 Marks)

6. a) Solve the equation \( L \frac{dv}{dt} + R \frac{v}{v} = E_0 \sin \omega t \) where \( L, R \) and \( E_0 \) are constants and discuss the case when \( t \) increases indefinitely. (06 Marks)

   b) Given \( \frac{dy}{dx} = 1 + \frac{y}{x} \), \( y = 2 \) at \( x = 1 \), find the approximate value of \( y \) at \( x = 1.4 \) taking step size \( h = 0.2 \) applying modified Euler’s method. (07 Marks)
c) Using Runge-kutta method of fourth order, find \( y(0.2) \) for the equation
\[
\frac{dy}{dx} \frac{y-x}{y+x}, \quad y(0)=1, \text{ taking } h = 0.2.
\]
(07 Marks)

Module - IV

7. a) Solve \( y'' - 4y' + 13y = \cos 2x \). (06 Marks)
   b) Solve \( y'' + 3y' + 2y = 12x^2 \). (07 Marks)
   c) Solve by the method of variation of parameters \( y'' + a^2 y = \sec ax \). (07 Marks)

8. a) Solve the Cauchy's homogeneous linear equation \( x^2 y'' - 2y = \left( x^2 + \frac{1}{x} \right) \). (06 Marks)
   b) Solve the Legendre's form of linear equation
\[
(1+x)^2 \frac{dy}{dx^2} + (1+x) \frac{dy}{dx} + y = \sin 2[\log (1+x)]
\]
(07 Marks)
   c) A series LR\( \underline{C} \) circuit has \( R = 4\Omega \), \( L = 1/2 \, \text{H} \), \( C = \frac{1}{26} \, \text{F} \) and a constant emf of voltage 13V. Find the charge on the capacitor and the current at any time \( t > 0 \), if there is no charge and no current initially. (07 Marks)

Module - V

9. a) Find the rank of a matrix \( A = \begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix} \). (06 Marks)
   b) Test for consistency and solve
\[
\begin{align*}
x + 2y + 3z &= 14 \\
4x + 5y + 7z &= 35 \\
3x + 3y + 4z &= 21.
\end{align*}
\]
(07 Marks)
   c) Find the value of \( \lambda \) for the following system of equations to have a non-trivial solution. Also find the non-trivial solution.
\[
\begin{align*}
x + y + 3z &= 0 \\
x + 3y + \lambda z &= 0 \\
2x + y + 2z &= 0.
\end{align*}
\]
(07 Marks)

10. a) Solve the following system of equations by Gauss Jordan method.
\[
\begin{align*}
x + y + z &= 9 \\
x - 2y + 3z &= 8 \\
2x + y - z &= 3.
\end{align*}
\]
(06 Marks)
   b) Solve the following system of equations by Gauss Seidel method.
\[
\begin{align*}
10x + y + z &= 12 \\
x + 10y + z &= 12 \\
x + y + 10z &= 12.
\end{align*}
\]
(07 Marks)
   c) Find the largest Eigen value and the corresponding Eigen vector of the matrix \( A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix} \) by the Rayleigh's power method. (07 Marks)
B. E. First Semester Examination – January 2019
Engineering Chemistry

Time: 3 hrs] [Maximum Marks: 100

Note: Answer any FIVE full questions, selecting at least ONE question from each module.

**MODULE - I**

1. a) What are reference electrodes? Illustrate the construction of calomel electrode. (07 Marks)
   b) Describe the potentiometric method of determining electrode potential.
   c) Calculate the emf of the cell, consisting of copper electrode dipped in 0.5 m CuSO₄ and silver electrode dipped in 0.25 m AgNO₃ solution. Write the cell representing, half cell and net cell reaction. Standard emg of cell is 0.46 V at 298 K. (06 Marks)

2. a) Derive Nernst’s equation for electrode potential. (07 Marks)
   b) What is concentration cell? Discuss the emf of concentration cell. (06 Marks)
   c) What are ion selective electrodes? Illustrate the determination of pH using glass electrode. (07 Marks)

**MODULE - II**

3. a) Illustrate and explain the following factors affecting corrosion.
   i) Emf   ii) Temperature   iii) Anodic area. (09 Marks)
   b) Discuss the pitting and water line corrosion. (06 Marks)
   c) Show the electro plating of copper. (05 Marks)

4. a) What is cathodic protection, explain sacrificial anodic method. (06 Marks)
   b) What is corrosion? Illustrate an electrochemical theory of corrosion taking iron as an example. (08 Marks)
   c) Show the mechanism of electroplating. (06 Marks)

**MODULE - III**

5. a) Discuss the preparation, properties and application of the following polymers.
   i) Polymethyl methacrylate
   ii) Butyl rubber
   iii) Neoprene rubber. (09 Marks)
   b) Illustrate and explain the glass transition temperature and factors affecting on it. (06 Marks)
   c) Justify the advantages of synthetic rubber over the natural rubber. (05 Marks)

6. a) Define conducting polymer? Predict the structure and mechanism of conducting polyacetylene. (07 Marks)
   b) Illustrate and explain the techniques of bulk and emulsion polymerization. (07 Marks)
   c) What is adhesive? Discuss the preparation properties and application of epoxy resin. (06 Marks)

**MODULE - IV**

7. a) Define secondary battery. Explain construction, working and application of lead-acid battery. (08 Marks)
   b) Predict the construction, working and application of Zn-air modern battery. (07 Marks)
   c) Define reforming? Write any three reforming reaction. (05 Marks)
8. a) What is fuel cell? Illustrate the construction, working and application of $\text{H}_2 - \text{O}_2$ fuel cell.  
   b) Define calorific value of a fuel. Describe the determination of calorific value of solid fuel using bomb calorimeter.  
   c) Calculate the gross and net calorific value by burning 0.83 gm of solid fuel in a bomb calorimeter. The temperature of 3500 gm of water increased from 26.5°C to 29.2°C. Water equivalent of calorimeter and latent heat of steam 385 gm and 597 cal/gm respectively. If the fuel contains 0.7% of hydrogen.  

   **MODULE - V**  

9. a) Define COD of sewage. Show how is it experimentally determined.  
   b) Explain sources and nature of impurity in water.  
   c) Explain principle behind the calorimeter, show its application.  

10. a) Explain the method of reverse osmosis for water purification.  
   b) Discuss the method of chlorination of water.  
   c) Illustrate and explain the conductometric titration of strong acid and strong base, weak acid and strong base.
Engineering Physics

Time: 3 hrs

[Maximum Marks: 100]

Note: Answer any FIVE full questions, selecting at least one full question from each module.

Physics constants: Electron mass, m = 9.11 \times 10^{-31} \text{ kg}, Electron charge, e = 1.6 \times 10^{-19} \text{ C}, Velocity of light, c = 3 \times 10^8 \text{ m/s}, Planck’s constant h = 6.625 \times 10^{-34} \text{ Js}, Avagadro number, N_A = 6.025 \times 10^{23} \text{ /mole}, Boltzmann constant, K = 1.38 \times 10^{-23} \text{ J/K}, Permittivity of vacuum, \varepsilon_0 = 8.85 \times 10^{-12} \text{ Fm}^{-1}.

Module – I

1. a) Explain photoelectric effect and give its physical significance. (04 Marks)
   b) Define phase velocity and group velocity. Derive an expression for group velocity on the basis of superposition of travelling waves. (08 Marks)
   c) Mention the characteristics properties of matter waves. (04 Marks)
   d) Compare the energy of a photon with that of a neutron when both are associated with wavelength 1 Å. Given that the mass of neutron is 1.678 \times 10^{-27} \text{ kg}. (04 Marks)

2. a) Describe Davison and Germer experiment and explain how it established the proof for wave nature of electrons. (08 Marks)
   b) Set up time independent Schrödinger wave equation. (08 Marks)
   c) An electron is bound in one dimensional potential well of width 0.12 \text{ nm}. Find the energy value in ground state and also first two excited state in eV. (04 Marks)

Module – II

3. a) Explain the construction and working of He-Ne laser, with the help of suitable diagrams. (08 Marks)
   b) Explain the method of measurement of pollutants in atmosphere using a laser. (04 Marks)
   c) Explain induced absorption and stimulated emission. (06 Marks)
   d) A laser medium oil thermal equilibrium temperature 300 K has two energy levels with a wavelength separation of 1 \mu m. Find the ratio of population densities of the upper and lower levels. (02 Marks)

4. a) Explain with necessary diagrams the construction and working of a semiconductor diode laser. (08 Marks)
   b) Define acceptance angle, numerical aperture and fractional index change. Derive an expression with a diagram for numerical aperture and the condition for propagation of a signal in an optical fiber. (08 Marks)
   c) Explain with diagrams single mode optical fiber and graded index multimode optical fiber. (04 Marks)

Module – III

5. a) What are Miller indices? How do you find the Miller indices for a given plane. Give an example. (07 Marks)
   b) Explain the crystal structure of sodium chloride. (05 Marks)
   c) Explain characteristics of x-rays. (04 Marks)
   d) Draw the following planes: (1 \ 0 \ 1), (1 \ 2 \ 0) (1 \ \bar{1} \ 0), (1 \ 2 \ 1). (04 Marks)

6. a) Derive the expression for interplanar distance in terms of Miller indices. (05 Marks)
   b) Describe how Bragg’s spectrometer is used to determine the crystal structure. (08 Marks)
   c) Calculate the packing factor for BCC and FCC. (04 Marks)
   d) Draw the following planes: (1 \ \bar{1} \ 0), (2 \ 0 \ 1), (0 \ 0 \ 1). (03 Marks)
Module - IV

7. a) What is polarization in dielectrics? Explain electronic, ionic and orientation polarization in dielectrics with neat diagrams.
   (10 Marks)

   b) Explain how a crystal with no center of symmetry acquires polarization when it is subjected to a pressure.
   (06 Marks)

   c) The dielectric constant of sulphur is 3.4. Assuming a cubic lattice for its structure, calculate the electronic polarizability of sulphur. Given for sulphur density = 2.07 gm/cc atomic weight = 32.07.
   (04 Marks)

8. a) What is Lorentz field? Derive an expression for the internal field in the case of dielectric liquids and solids.
    (08 Marks)

   b) What are ferroelectric materials? Describe in detail the ferroelectric hysteresis.
    (06 Marks)

   c) Mention the applications of biomaterials.
    (03 Marks)

   d) What is the polarization produced in a sodium chloride by an electric field of 600 V/mm if it has a dielectric constant of 6?
    (03 Marks)

Module - V

9. a) Define mean free path, relaxation time and Fermi energy. Obtain the expression for electrical conductivity in terms of mean collision time.
    (08 Marks)

   b) Explain the failures of classical free electron theory.
    (06 Marks)

   c) What are conduction electrons? Write the assumptions of classical free electron theory.
    (06 Marks)

10. a) Derive an expression for density of states for conduction electrons per unit volume of metal.
     (08 Marks)

    b) Define the terms relaxation time and Fermi energy and describe how quantum free electron theory has been successful in overcoming the failures of classical free electron theory.
     (08 Marks)

    c) Calculate the Fermi energy eV for silver at 0K, given that the density of silver = 10.500 kg/m³, atomic weight = 107.9, and it has one conduction per atom.
     (04 Marks)
**Engineering Physics**

**Module - I**

1. a) Explain Wave – particle dualism. Derive the relation between phase velocity and group velocity.  
   (08 Marks)
   b) Summarize characteristics of matter waves.  
   (05 Marks)
   c) Derive an expression for De-Broglie wavelength using concept of group velocity.  
   (07 Marks)

2. a) State and explain Heisenberg uncertainty principle and justify electron not exist inside the nucleus.  
   (10 Marks)
   b) Derive Time - independent Schrodinger equation.  
   (06 Marks)
   c) Evaluate De – Broglie wavelength of a helium nucleus that is accelerated through 500 V  
   Given: Mass of proton = 1.67 x 10^{-27} kg.  
   (04 Marks)

**Module - II**

3. a) Explain basic principles of laser worth energy level diagram.  
   (09 Marks)
   b) Describe the construction and working of Nd – YAG laser with suitable diagram.  
   (07 Marks)
   c) Calculate angle of acceptance when it is in a medium of refractive index 1.33.  
   The angle of acceptance of an optical fiber is 30° when kept in air.  
   (04 Marks)

4. a) Describe any two attenuation mechanism in optical fiber.  
   (06 Marks)
   b) Explain different types of optical fiber.  
   (09 Marks)
   c) Calculate the wavelength of light emitted at 330 K when the ratio of population of two energy level is 1.059 x 10^{-30}.  
   (05 Marks)

**Module - III**

5. a) Define the following terms:  
   i) Space lattice  
   ii) Bravian lattice  
   iii) Non-Bravian lattice  
   iv) Lattice parameters  
   v) Unit cell  
   vi) Lattice point.  
   (06 Marks)
   b) Describe Seven Crystal Systems.  
   (07 Marks)
   c) Sketch the following planes in a cubic unit cell  
   (1 2 3), (1 0 1), (0 1 0), (1 2 2), (1 1 1), (2 0 2) and (0 2 0).  
   (07 Marks)

6. a) Define Miller indices. Illustrate the procedure to find Miller indices.  
   (06 Marks)
   b) Define APF. Calculate APF for SC, BCC, fcc systems.  
   (08 Marks)
   c) Derive an expression for interplanar spacing for cubic unit cell.  
   (06 Marks)
Module - IV

7. a) Discuss Polar, Non Polar dielectrics with examples. (06 Marks)
    b) Derive Clausius – Mossotti equation. (05 Marks)
    c) Define Ferroelectric material. Explain Hysteresis loop. (05 Marks)
    d) What is the polarization produced in NaCl by an electric field of 500 V/m. Given: Relative permittivity is 6. (04 Marks)

8. a) Derive an expression for internal field in liquids and solids. (08 Marks)
    b) Explain any two different polarization mechanisms in dielectrics. (06 Marks)
    c) Illustrate the important applications of dielectrics and ferroelectrics. (06 Marks)

Module - V

9. a) Summarize the assumptions of classical free electron theory and explain any two failures. (10 Marks)
    b) Define Fermi energy and Fermi factor. Discuss the variations of Fermi factor with temperature. (06 Marks)
    c) Find the electron density for a metal with Fermi energy 3 eV. (04 Marks)

10. a) Classify conducting materials with examples. Discuss any two major success of quantum free electron theory. (09 Marks)
    b) Compare conductors and superconductors. List application of superconductors. (07 Marks)
    c) Calculate the probability that an electron occupies an energy level 0.002 eV above the Fermi level at 300 K. (04 Marks)
B.E. First Semester Examination – January 2019
Engineering Chemistry

Time: 3 hrs

Note: Answer any FIVE full questions, selecting at least ONE full question from each Module.

[Maximum Marks: 100]

Module - I

1. a) Define oxidation, reduction potential and discuss potentiometric method of determining electrode potential. (06 Marks)
b) What are reference electrodes. Discuss construction, working of Calomel electrode. (06 Marks)
c) Define emf and derive Nernst equation. (08 Marks)

2. a) Explain ion selective electrode and discuss pH determination using glass electrode. (10 Marks)
b) Calculate how much voltage is produced in a cell consisting of Zn and Cu electrodes. Zn electrode is dipped in 0.08 m solution of Zn\(^{2+}\) and Cu electrode in 0.5 m solution of Cu, \(E^{\circ}_{\text{cell}} = 1.23\) volts, write its half cell, complete cell reaction and cell representation. (06 Marks)
c) Discuss construction and working of Ag/ Agcl electrode. (04 Marks)

Module - II

3. a) Explain electroplating mechanism. Given an account of electroplating of copper. (08 Marks)
b) Write a note on corrosion Inhibitors. (04 Marks)
c) Explain decomposition potential. (04 Marks)
d) Explain stress corrosion. (04 Marks)

4. a) Define corrosion and explain electro chemical theory of corrosion taking iron as an example. (07 Marks)
b) Explain the effect of following factors on corrosion rate. i) Emf ii) Cathodic area iii) pH (09 Marks)
c) Explain impressed current method of cathodic protection. (04 Marks)

Module - III

5. a) Explain the technique of bulk and emulsion polymerization. (10 Marks)
b) Define glass transition temp. Explain the factors affecting on it. (05 Marks)
c) What are adhesives? Write preparation, properties and application of Epoxy resin. (05 Marks)

6. a) Write a note on conducting polymer taking polynacetylene as an example. (08 Marks)
b) Write preparation, properties and application of i) Teflon ii) Polyurethane iii) Nitrile rubber (09 Marks)
c) Define Elastomer. Explain deficiencies of Natural rubber. (03 Marks)

Module - IV

7. a) Define battery. Explain construction, working and applications of Zinc – Air battery. (06 Marks)
b) What are fuel cells? Discuss construction, working and application of Methyl alcohol – oxygen fuel cell. (06 Marks)
c) Explain construction, working and application of Ni – Cd battery. (08 Marks)

8. a) Explain construction, working and application of Lead – acid battery. (08 Marks)
b) What is cracking. Explain fluidized bed catalytic cracking. (04 Marks)
c) Define calorific value. Explain the determination of calorific value of a fuel by using Bomb calorimeter. (08 Marks)
Module - V

    b) Write a note on Freundlich theory.

     b) Explain reverse – osmosis method of water softening.
     c) Define BOD. Explain the determination of BOD experimentally.
B. E. First Semester Examination – January 2019
Basic Electrical Engineering

Time: 3 hrs]
[Maximum Marks: 100
Note: Answer any FIVE full questions, selecting at least ONE full question from each module.

**MODULE - I**

1. a) Show that current in pure capacitor leads the voltage by a quarter cycle. Draw the necessary circuit, phasor diagram and waveforms.
   (05 Marks)

   b) Derive the expression for power in series R-L circuit, starting from first principle. Support your answer with phasor diagram and waveforms.
   (08 Marks)

   c) A resistance of 50Ω, an inductance of 100mH and a capacitor of 200μF are connected in series. The circuit is supplied from a 230V, 50Hz supply. Calculate the impedance, current, power factor, phase angle, active power and reactive power.
   (07 Marks)

2. a) List the advantages of three phase system over single phase system.
   (05 Marks)

   b) Determine the relation between phase and line values for voltage and current in a three phase balanced star connected supply system.
   (08 Marks)

   c) Three identical coils, each having resistance of 40Ω and reactance of 40Ω are connected in delta. The coils are supplied from a 440V, 3-phase lines. Calculate the phase current, line current, 3-phase power and readings on each of the two watt meters connected to measure the power.
   (07 Marks)

**MODULE - II**

3. a) State Fleming’s right hand rule, Fleming’s left hand rule and Lenz’s law.
   (05 Marks)

   b) Derive the expression for co-efficient of coupling in terms of self inductances of each coil and mutual inductance between them.
   (08 Marks)

   c) Two coils, A of 1500 turns and B of 3000 turns lie in parallel planes. A current of 6A in coil A produces a flux of 0.1mWb in it. While the same current in coil B produces a flux 0.2mWb. If 60% of the flux produced by coil A links with coil B, determine self inductance of each coil, mutual inductance between them, co-efficient of coupling and the emf induced in coil A and coil B when current in coil A changes from 5A to -5A in 0.01 second.
   (07 Marks)

4. a) Name the types of transformer based on construction. Explain the working principle single phase transformer with necessary diagram.
   (05 Marks)

   b) Describe the open circuit and short circuit tests conducted on transformer to determine the losses with neat circuit diagram.
   (08 Marks)

   c) A single phase 500kVA transformer, working at unity power factor, has an efficiency 92% on both half-load and full-load. Determine its efficiency on 80% of full-load.
   (07 Marks)

**MODULE - III**

5. a) Draw the circuit, write the equations for current and generated emf for a series and short-shunt DC generators.
   (05 Marks)

   b) With neat sketch of cross-section of a DC generator, explain the function of each part in detail.
   (08 Marks)

   c) A 4-pole D.C. shunt generator with a wave wound armature, having 39 armature slots with 10 conductors per slot, supplies a load of 5000W at a terminal voltage of 250V. The armature and shunt field resistances are 0.05Ω and 50Ω respectively. If the brush contact drop is 1 volt per brush, determine the generated emf. Also calculate the speed at which the generator should be driven, if the flux per pole is 30mWb.
   (07 Marks)
6. a) What is back emf? Explain the significance of the back emf.
b) Why starters are necessary for D.C. motors? With neat circuit connections explain the three point starter used for D.C. motor.
c) A 4-pole D.C. shunt motor takes a current of 22A from a 220V supply. The armature and field resistances are 0.5Ω and 110Ω respectively. The armature is lap connected with 300 conductors. If the flux per pole is 20mWb, calculate the speed, armature torque and power developed in armature.

MODULE - IV

7. a) List the advantages of stationary armature over rotating armature.
b) Describe with neat sketch, the two types of rotors of an alternator.
c) A 3-phase, 8-pole alternator has a star connected winding with 120 slots and 12 conductors per slot. The flux per pole is 30mWb sinusoidally distributed and the speed is 750rpm. Find the frequency, the phase and the line emf.

8. a) Name the types of rotors in 3-phase induction motor. Explain any one with neat sketch.
b) Explain the concept of rotating magnetic field in a 3-phase induction motor with necessary phasor diagram.
c) A 6-pole alternator driven at a speed of 1000 rpm supplies power to a 4-pole, 3-phase, induction motor which is running at a speed of 1440 rpm. Find the synchronous speed, slip, frequency of rotor emf at a slip of 4%, relative speed and frequency of rotor emf when the rotor is stationary.

MODULE - V

9. a) With neat block diagram, explain the solar power generating station.
b) What is a tariff? Name the desirable characteristics of a tariff. Explain any two in brief.
c) Describe the block rate tariff and Two-part tariff. Also list their advantages and disadvantages.

10. a) What is electric shock? What are the precautions to be considered against it?
b) Describe the construction and working of a single phase induction type energy meter with neat diagram.
c) What is earthing? Explain the pipe earthing with neat sketch.
B. E. First Semester Examination – January 2019
C Programming for Problem Solving

Time: 3 hrs] [Maximum Marks: 100
Note: Answer any FIVE full questions, selecting atleast ONE full question from each module.

MODULE - I
1. a) With a neat diagram, explain basic structure of a computer. (06 Marks)
b) Define an algorithm. Design an algorithm to find roots of quadratic equation. (08 Marks)
c) Discuss with example C tokens. (06 Marks)

2. a) Explain the basic structure of a C program, list the steps to execute the C program. (10 Marks)
b) Compare i) Logical and bitwise operators (10 Marks)
ii) Formatted and unformatted output statements.

MODULE - II
3. a) List the different forms of if statements. Explain switch statements with its syntax and develop a program to implement simple calculator using switch. (10 Marks)
b) Build a C program to find the largest of 3 numbers using else-if statement. (06 Marks)
c) Describe unconditional control statement. (04 Marks)

4. a) Compare while and do-while statements. (06 Marks)
b) Outline the steps of looping processes and explain for loop with example. (08 Marks)
c) Develop a program in C to print n\textsuperscript{th} Fibonacci number. (06 Marks)

MODULE - III
5. a) Explain with example declaration and initialization of one dimensional array (compile time, run time). (10 Marks)
b) Develop a C program to find product of 2-matrics. (10 Marks)

6. a) Define string. Design a C program to find length of a string without using C library function. (10 Marks)
b) List and illustrate string handling functions in C library with example each. (10 Marks)

MODULE - IV
7. a) List the three elements of user defined functions. Explain in detail with general format “Definition of Functions”. (10 Marks)
b) Illustrate with example five categories of functions. (10 Marks)

8. a) Explain with example defining a structure. Give the general format of structure definition. (10 Marks)
b) Illustrate the use of structure with the C program to calculate the subject-wise and student-wise total and store them as a part of the structure. (10 Marks)

MODULE - V
9. a) Discuss the benefits of using pointers in C. (05 Marks)
b) Design a C program to swap two numbers using pointers. (08 Marks)
c) Develop a program using pointers to compute the sum of all elements stored in an array. (07 Marks)

10. a) Develop a C program to read data from the keyboard, write it to a file called INPUT again read the same data from the INPUT file, and display it on the screen. (08 Marks)
b) Discuss error handling during I/O operations, support the answer by designing a program to illustrate error handling during I/O operations. (12 Marks)
B.E. First Semester Examination – January 2019
Basic Electronics

Time: 3 hrs] [Maximum Marks: 100

Note: Answer any FIVE full questions, selecting at least ONE full question from each module.

Module – I

1. a) Derive an equation for conductivity of intrinsic semiconductor. 
   b) Define drift and diffusion currents
   c) In an N-type semiconductor, the fermilevel is 0.3 eV below the conduction level at room temperature of 300°K. If the temperature increases to 360°K, determine the new position of the fermilevel.
   (08 Marks)

2. a) What is a p-n junction, draw the V-I characteristics.
   b) With the help of relevant circuit diagram and input-output waveforms explain the working of half wave rectifier.
   c) A bridge rectifier feeds a load resistance of 2kΩ, from a 50 volts rms supply, each diode has a forward resistance of 10Ω. Calculate i) The load voltage ii) Ripple voltage of output iii) Percentage regulation.
   (04 Marks)
   (10 Marks)
   (06 Marks)

Module - II

3. a) Explain the output characteristics of common emitter configuration of npn transistor.
   b) What is biasing and thermal runaway? Explain the voltage divider bias circuit.
   c) In a fixed bias circuit, the β of the transistor is 100, V_{ce}=6V, R_C=3kΩ and R_B= 530kΩ, draw the DC load line and determine operating point. Assume V_{BE} = 0.7V.
   (06 Marks)
   (10 Marks)

4. a) What is operating point of the transistor, define different stability factors.
   b) What is gain of an amplifier, write equation for power gain in dB?
   c) Draw a circuit diagram of two stage RC-coupled amplifier and explain its frequency response curve.
   (04 Marks)
   (06 Marks)

Module - III

5. a) Derive an equation that shows the relationship between gain with and without feed back in case of positive feedback.
   b) Explain the advantages of negative feedback.
   c) Draw the circuit diagram of RC-phase shift and Hartly oscillators.
   d) State the Barkhausen’s criterion for sustained oscillations.
   (06 Marks)
   (08 Marks)
   (04 Marks)
   (02 Marks)

   b) Explain the block diagram of operational amplifier and list its ideal characteristics.
   (10 Marks)
   (10 Marks)

Module - IV

7. a) What is modulation and explain need for modulation.
   b) Draw the block diagram of super heterodyne receiver.
   c) Show that in amplitude modulation process the total power is \( P_T = 1.5 \ P_c \).
   (08 Marks)
   (04 Marks)
   (08 Marks)
8. a) What is transducer, with a neat sketch and curves explain the working of LVDT.  
   b) What is loudspeaker? Explain in detail how a CRO can be used to measure amplitude,  
      phase and frequency of the signal.  

   Module - V  

9. a) Explain the properties of Boolean algebra.  
   b) Why simplification of Boolean expressions are necessary?  
   c) i) Represent the decimal numbers.  
      20 and 40 in signed binary numbers.  
      ii) Simplify and implements the given Boolean expression using logic gates  
          i) \( (A \cdot AB) \cdot (B \cdot AB) \)  
          ii) \( A + \overline{AB} \).  

10. a) Draw the truth table and logic symbols of all the logic gates.  
    b) Draw the circuit diagram of RTL-NOR, DTL-NAND and NOT-gate using transistor.  
    c) By using logic gate implement a full adder circuit.
B. E. First Semester Examination – January 2019
Fundamentals of Electrical Engineering

Time: 3 hrs

Note: Answer any FIVE full questions, selecting at least ONE full question from each Module.

Module - I

1. a) State and explain Kirchoff’s current law and Kirchoff’s voltage law. (06 Marks)
b) Determine current in each branch of fig 1. Also determine power consumed by 5 Ω resistor. (06 Marks)
c) Find the currents in all the branches of network shown in fig 2. Find also potential difference between A and B.

Fig. 1

2. a) Derive an expression for energy stored in an inductive coil. (08 Marks)
b) Define coefficient of coupling between two coils. Derive the equation for it in terms of L₁, L₂ and M. (06 Marks)
c) A coil of 1200 turns is wound on a ring of silicon steel of relative permeability 1500. The cross sectional area of ring is 10 Sq.cm and mean diameter of ring is 15 cm. Determine the following when a current of 6 A is flowing through the coil.
   i) Flux in the core  ii) Inductance of coil
   If the current in the coil is uniformly reversed in 10 milliseconds, determine the emf induced in the coil. (06 Marks)

Module - II

3. a) Show that the power consumed in a series R-C circuit is \( V \text{I cos} \phi \). Draw the waveforms and phasor diagram. (06 Marks)
b) A voltage of 177.2 Volts, 50 Hz is applied to a series circuit consisting of a resistor, an inductor and a capacitor. The respective voltages across these elements are 170 V, 150 V and 100 V. Current through the circuit is 4 A. Find
   i) Power factor  b) Impedance  c) resistance  d) Inductance  e) Capacitance. (06 Marks)
c) Find total current, power consumed and power factor of the circuit shown in figure 3. (08 Marks)

4. a) Derive relation between line voltage and phase voltage of 3 phase star connected system. (06 Marks)
b) With necessary vector diagram, show that two wattmeters are sufficient to measure 3 phase power. (08 Marks)
c) Three arms of a 3 - phase delta connected load are connected across 3 - phase, 415 V, 50 Hz supply. Each arm comprises of a coil of resistance 25 Ω and an inductance of 0.15 H in series with a capacitor of 120 μF. Calculate line current, power factor and power consumed.

Fig. 3 (06 Marks)
Module - III

5. a) Give the constructional details of single phase energymeter and explain its working. (08 Marks)
b) Explain the necessity of earthing. With necessary diagrams explain plate earthing. (08 Marks)
c) What is electric shock. Explain the precautions to be taken to prevent electric shock. (04 Marks)

6. a) Derive EMF equation of a transformer. (06 Marks)
b) What are the losses in a transformer? How they vary with load? How these losses can be minimized. (06 Marks)
c) A 500 kVA transformer has efficiency of 91% both at full load, unity p.f and half-full load, 0.7 p.f. Determine its efficiency at 80% full load, 0.9 p.f. (08 Marks)

Module - IV

7. a) Derive EMF equation of a DC generator. (06 Marks)
b) With a neat sketch give the constructional details of a DC generator. (08 Marks)
c) A 4 pole, lap connected DC generator has 600 armature conductors and runs at 1000 rpm. Calculate the EMF induced, if the flux per pole is 0.05 Wb. Determine the speed with which it should be driven to generate same EMF, if armature is wave connected. (06 Marks)

8. a) Derive the torque equation of a DC motor. (06 Marks)
b) Explain the necessity of starters for DC motors. With a neat sketch, explain 3 point starter. (07 Marks)
c) A 4 pole DC shunt motor takes 22 A from 240 V supply. The armature and field resistances are 0.4 Ω and 120 Ω respectively. The flux/pole is 0.015 Wb. Determine i) Speed ii) Torque developed iii) Electric power developed in motor. Neglect brush drop. (07 Marks)

Module - V

9. a) With neat sketch give the constructional details of salient pole alternators. (08 Marks)
b) Derive EMF equation of alternators. (06 Marks)
c) A 3-phase, 16-pole alternator has star connected winding with 144 slots and 10 conductors/slot. The flux per pole is 20 mWb. Determine the phase and line voltage generate. Speed of alternator is 375 rpm. (06 Marks)

10. a) Show that a revolving magnetic field is produced by the stator of a 3 phase induction motor when it is fed with 3 phase supply. (08 Marks)
b) Explain the working principle of a 3 phase induction motor. (06 Marks)
c) A 3-phase, 4 pole, 400 Volts, 50 Hz induction motor runs with a slip of 6%. Determine the rotor speed and frequency of rotor EMF. (06 Marks)
B. E. First Semester Examination – January 2019
Mechanical Engineering Science

Time: 3 hrs
Note: 1. Answer any FIVE full questions, selecting at least ONE full question from each module.
    2. Steam tables are permitted.

MODULE - I

1. a) State the laws of thermodynamics.  (08 Marks)
    b) What is global warming? Explain what causes global warming and Ozone depletion, and how global warming can be controlled?  (12 Marks)

2. a) Explain how solar energy can be converted to electrical energy.  (10 Marks)
    b) Illustrate with wind-mill how wind energy is converted to electrical energy.  (10 Marks)

MODULE - II

3. a) Illustrate with the help of temperature-Enthalpy graph the formation of steam at constant pressure.  (10 Marks)
    b) Evaluate the internal energy of 1 kg of steam at a pressure of 10 bar, when
       i) The steam is dry   ii) When the steam is 90% dry.  (10 Marks)

4. a) Differentiate between a mounting and an accessory in boilers and explain one mounting and one accessory.  (10 Marks)
    b) Illustrate the working of Pelton wheel with sketch and state the advantages of hydel energy.  (10 Marks)

MODULE - III

5. a) Compare two stroke cycle with four stroke cycle I.C. engine and also diesel cycle with Otto cycle I.C. engine.  (10 Marks)
    b) Following readings were taken on a 4-stroke cycle I.C. engine:
       Diameter of brake-drum = 1.5mts, rope diameter = 10mm, load suspended on brake-drum = 981N, spring balance reading = 49.05N, speed = 200 r.p.m. Determine the brake-power of the engine.  (10 Marks)

6. a) Illustrate with the block diagram the working of vapour-compression system of refrigeration and explain.  (10 Marks)
    b) List the different refrigerants and give the characteristics of any two refrigerants.  (10 Marks)

MODULE - IV

7. a) Differentiate drilling operation and boring operation and list out the operations of lathe machine.  (10 Marks)
    b) Illustrate the arc welding process with sketch and give the importance of flux in welding.  (10 Marks)

8. a) Illustrate with line diagram the working of a Radial drilling machine and give its advantages.  (10 Marks)
    b) Illustrate the gas welding set-up and give the flame characteristics in gas welding.  (10 Marks)

MODULE - V

9. a) Summarize the objectives of lubrication and explain splash lubrication method.  (10 Marks)
    b) Compare sliding contact bearings with rolling contact bearings and explain any one anti-friction bearing.  (10 Marks)
10. a) Derive the expression for velocity-Ratio in belt drives and explain jockey pulley and its importance.

b) A compound gear train consists of 4 gears ABCD, having 20, 30, 40 and 60 teeth respectively. A is keyed to driving shaft and D is keyed to the driven shaft. Gears B and C are compounded. If rotates at 180rpm, evaluate the speed of gear D.

(10 Marks)
B.E. First Semester Examination – January 2019
Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs

[Maximum Marks: 100]

Note: 1) Answer any five full questions, selecting at least one full question from each Module.
2) Assume suitably missing data.

**MODULE – I**

1. a) What are the scopes of i) surveying ii) Irrigation engineering. (06 Marks)
   b) Draw the cross section of road and label its components. State their importance. (06 Marks)
   c) Explain the different infrastructure required for the development of a nation based on socio-economic condition. (08 Marks)

2. a) What are Deck and through type of bridges. Draw and label on bridge for each type. (06 Marks)
   b) List out the differences between the gravity Dams and earthen dams. (06 Marks)
   c) To which type of structure does the following components belong.
   i) Base coarse ii) Pier iii) Kerb iv) Shoulders v) Impervious core vi) Spill way
   vii) Free board viii) Spring level. (08 Marks)

**MODULE – II**

3. a) What are the characteristics of couple? (04 Marks)
   b) Explain i) Law of Transmissibility of forces ii) Law of physical independence
   iii) Parallelogram law forces iv) Continuum. (08 Marks)
   c) A co-planar concurrent force system is acting on a hexagon as shown in fig 3 (c). Determine the magnitude and direction of the resultant. (08 Marks)

   ![Fig 3 (c)]

4. a) Define i) Force and its characteristics ii) Non-coplanar, non-concurrent force system ii) Composition and resolution of forces. (06 Marks)
   b) A boat is pulled by two ropes carrying forces as shown in fig 4(b). If the resultant of the pull along the centre line is 2100 N. Find ‘F’ and angle ‘θ’. (06 Marks)
   c) Find the equivalent force and couple system about ‘O’ for the system of forces acting shown in fig 4(c). (08 Marks)

   ![Fig 4(b)]
   ![Fig 4(c)]
5. a) State and prove Varignon's principle of moments. 
   b) Explain i) Free body diagram ii) Conditions of equilibrium. 
   c) Find the horizontal intercept of the resultant force from point ‘A’ for the system of 
      forces shown in fig 5(c). 
      Each mesh 1m x 1m (size: 4m x 4m).

6. a) State and prove Lami's theorem. 
   b) Find the tension in the strings AB, BC and CD and the weight ‘W’ for the forces 
      shown in fig 6(b) to be equilibrium. 

   ![Fig 5(c)](image) ![Fig 6(b)](image)

   c) Two cylinders are placed in a trapezoidal notch of width 325 mm. Cylinder ‘A’ has 
      radius 100 mm and weight 1000 N. Cylinder ‘B’ has radius 150 mm and weight 
      1500 N. Find the reaction at the points of contact P, Q, R and S shown in fig 6(c).

   ![Fig 6(c)](image)

7. a) Define i) Angle of Friction ii) coefficient of friction and iii) Cone of friction. 
   b) Explain the various types of supports with their reactions.
c) Find the support reactions for the beam loaded as shown in fig 7 (c).

Fig 7(c)

8. a) State the laws of static friction.
   b) A body weighing 200 N is placed on a rough inclined plane at 45° is shown in fig 8(b). Find the parallel force ‘P’ required to move the body up the plane, if angle of friction is 15°.

Fig 8(b)

c) Find the horizontal force ‘P’ required at the bottom to prevent the slipping of a ladder weighing 200 N and length 6 m making an angle of 60° with horizontal, when a man weighing 800 N will climb up the ladder by 5 m from bottom. Take coefficient of friction between ladder and wall as 0.3 and ladder and floor as 0.25.

MODULE - V

9. a) Find the moment of Inertia of a triangle of base ‘b’ and height ‘h’ about yy-axis.
    b) Locate the centroid of the shaded area shown in fig 9(b) with respect to ‘O’.

10. a) Derive the formula for the centroid of a semi-circle of radius ‘r’ from its diameter.
    b) Find the polar radius of gyration of shaded area shown in fig 10(b).

Fig 9(b)  Fig 10(b)
B. E. First Semester Examination – January 2019
Environmental Studies

Time: 3 hrs]  [Maximum Marks: 100

Note: Answer any FIVE full questions selecting at least ONE full question from each module.

Module - I

1. a) What is ecosystem? Explain the structural and functional units of an ecosystem. (10 Mark)
   b) Explain the concept of Balanced ecosystem. (10 Mark)

2. a) Write a note on effects of housing activities on environment. (10 Mark)
   b) Define mining and explain the effects of mining on environment. (10 Mark)

Module - II

3. a) Classify the water resources and explain the importance of water resources. (10 Mark)
   b) Define water borne diseases and explain in brief causes and control of water borne diseases. (10 Mark)

4. a) With a neat flow chart explain the Sulphur cycle. (10 Marks)
   b) Explain in brief effects of transportation activity on environment. (05 Marks)
   c) Write the benefits of forest resources. (05 Marks)

Module - III

5. a) With a neat flow chart explain the carbon cycle. (10 Marks)
   b) Write a note on fluoride problems in drinking water and explain any one method for fluoride removal. (10 Marks)

6. a) Write the advantages and disadvantages of renewable and non -renewable sources of energy. (05 Marks)
   b) Explain the need for sustainable development. (05 Marks)
   c) With a neat sketch explain the Bio-gas energy. (10 Marks)

Module - IV

7. a) Define EIA and explain the methodology process of EIA. (10 Marks)
   b) Define noise pollution and explain the effects of noise pollution. (10 Marks)

8. a) Write a note on global warming and climate change. (10 Marks)
   b) Define urbanization and write the effects of urbanization. (05 Marks)
   c) Define water pollution and explain the effects of water pollution. (05 Marks)

Module - V

9. a) Define Acid rain; explain in brief causes for acid rain. (05 Marks)
   b) Discuss in brief functions of NGO. (05 Marks)
   c) Explain the role of environmental education in environment protection. (10 Marks)

10. a) Explain the importance of Women’s education. (10 Marks)
    b) Explain the brief role of government in the protection of environment. (10 Marks)
B. E. First Semester Examination – January 2019
Constitution of India and Professional Ethics
(Common to all branches)

Time: 3 hrs] [Maximum Marks: 100
Note: Answer any FIVE full questions, selecting at least ONE full question from each module.

Module-I

1. a) Describe various salient features of Constitution of India. (08 Marks)
b) Interpret terms mentioned in Preamble to the Constitution of India. (08 Marks)
c) List out the various fundamental rights of Indian citizen. (04 Marks)

2. a) Justify the statement made by Dr. B. R. Ambedkar “Article 32 is the soul and heart of our Constitution” (08 Marks)
b) Classify various Sources of Constitution of India? (08 Marks)
c) Explain article 22 of the constitution to safeguard the personal liberty of a person in case of Arrest and Detention? (04 Marks)

Module-II

3. a) Elaborate various Directive Principles of State policy under Constitution (10 Marks)
b) Assess various power of High Court (06 Marks)
c) What are required qualifications for becoming MLA? (04 Marks)

4. a) Fundamental Duties influence to promote patriotism in Indian citizen (08 Marks)
b) Identify various powers and functions of Chief minister (08 Marks)
c) What are required qualifications for becoming Governor? (04 Marks)

Module-III

5. a) What are the Power & Function of Prime minister of India? (08 Marks)
b) Identify the various Merits and De-merits of Public Interest Litigation (PIL)? (06 Marks)
c) What are the various function of Indian President? (06 Marks)

6. a) Explain the various Powers of President of India (10 Marks)
b) Outline the jurisdiction of Supreme court. (06 Marks)
c) What are required qualifications for becoming Supreme Court Judge. (04 Marks)

Module-IV

7. a) Explain the various Constitutional provisions for Children (08 Marks)
b) Classify the types of Emergencies under Constitution of India? (08 Marks)
c) Election commission of India is an important body in the world’s Largest Democracy. Justify. (04 Marks)

8. a) Illustrate various Constitutional provision for protect the rights of women. (08 Marks)
b) Explain the function of Election Commission Of India. (08 Marks)
c) List out various Constitutional provisions for SC/ST. (04 Marks)

Module-V

9. a) When does a professional engineer will loose his integrity? (07 Marks)
b) Safety is a dynamic concept. Elaborate. (08 Marks)
c) Explain the aims of engineering ethics. (05 Marks)

10. a) Illustrate the various responsibilities of Engineers. (08 Marks)
b) Classify the types of Impediments towards responsibilities of Engineers. (08 Marks)
c) Evaluate the fundamental canons of the engineer’s code of ethics. (06 Marks)
B.E. First Semester Examination – January 2019
Mechanical Engineering Science

Time: 3 hrs] [Maximum Marks: 100

Note: 1) Answer any FIVE full questions, selecting at least ONE full question from each Module.
2) Use of steam table is permitted.

Module – I

1. a) Define Capital and Celestial energy sources. Name the different Energy sources of two types.
   b) Explain briefly the principle of conversion of solar energy directly into electrical energy.
   c) Write the differences between conventional and non-conventional energy sources.

(06 Marks) (08 Marks) (06 Marks)

2. a) Classify energy sources with examples.
   b) Explain with block diagram of Geo-thermal energy conversion.
   c) With neat diagram explain conversion of wind energy into electrical energy.

(04 Marks) (08 Marks) (08 Marks)

Module – II

3. a) Define the followings:
   i) Dryness fraction ii) Latent heat
   iii) Sensible heat iv) Specific volume.
   b) Explain with neat sketch construction and working of Babcock and Wilcox boiler.
   c) Two kg of dry saturated steam at 1 MPa is produced from water at 40°C. Determine the quantity of heat supplied. The specific heat of water $c_{pw} = 4.18 \text{ kJ/kg K}$.

(04 Marks) (10 Marks) (06 Marks)

4. a) Explain with neat sketch working of closed cycle Gas turbine.
   b) With neat diagram explain working of Pelton Wheel turbine.
   c) Write the differences between Impulse and Reaction Steam Turbines.

(06 Marks) (06 Marks) (08 Marks)

Module – III

5. a) How IC Engines are classified?
   b) With the help of P-V diagram explain working of four –stroke Diesel engine.
   c) The following observations were recorded during a test on a 4 - stroke engine.
   Bore = 25 cm, Stroke = 40 cm, Crank speed = 250 rpm, Net load on the Brake drum = 700 N, Drum diameter = 2m, IMEP = 6 bar,
   Fuel consumption = 0.0013 kg/sec, Specific gravity of fuel = 0.78,
   Calorific value of fuel = 43900 kJ/kg. Determine:
   i) IP ii) BP iii) Indicated Thermal efficiency and v) Brake Thermal efficiency.

(04 Marks) (08 Marks) (08 Marks)

6. a) Define the followings: i) Ton of Refrigeration ii) COP of Refrigerator
   b) Explain with neat diagram working of room Air conditioner.
   c) Write the differences between Vapour Compression Refrigerator and Vapour Absorption Refrigerator.

(04 Marks) (08 Marks) (08 Marks)

Module – IV

7. a) List the operations carried on Lathe machines.
   b) With neat sketch explain working of Radial drilling machine.
   c) Explain with neat sketch principle of Milling.

(04 Marks) (08 Marks) (08 Marks)

8. a) Define the welding. Write the differences between soldering and welding.

(06 Marks)
b) Explain with neat sketch working of Electric Arc Welding.

c) With the help of a neat sketch explain the working of Horizontal Milling Machine.

Module - V

9. a) Name the different types of power transmission and explain how open and cross belt drive functions.
    b) Explain with neat sketch working of Fast and Loose pulley
    c) A compound Gear train consist of 4 gears A, B, C and D and they have 20, 30, 40 and 60 teeth respectively. A is keyed to driving shaft and D is keyed to the driven shaft, B and C are compounded gears, b meshes with A and C meshes with D. If A rotates at 180 rpm, find the rpm of D. Also sketch the arrangement.

10. a) Why Lubrication is necessary in moving parts of machines and mention its types with examples.
    b) Explain with neat sketch working of Automatic Camera.
    c) Distinguish between the Open Loop and Closed Loop Control Systems.
B. E. First Semester Examination – January 2019
Programming in C

Time: 3 hrs] [Maximum Marks: 100

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

MODULE - I

1. a) Explain basic structure of ‘C’ programming. (07 Marks)
   b) What are computer networks? Briefly explain different types of networks. Discuss the impact of internet on today's world. (06 Marks)
   c) Explain formatted input and output statement with an example. (07 Marks)

2. a) Define data types. With suitable examples, explain different basic data types. (08 Marks)
   b) Write an algorithm and flowchart to check whether given number is positive or negative, find sum of positive and sum of negative numbers. (06 Marks)
   c) With suitable examples explain operator precedence and associativity in C. (06 Marks)

MODULE - II

3. a) Illustrate different forms of statements. Write a C program to find largest of three numbers. Using a nested if, else statement. (12 Marks)
   b) Write syntax for switch statement and implement on ‘C’ program simple calculator using switch statement. (08 Marks)

4. a) Illustrate with an example white & do-while statement. Differentiate while, do while. (10 Marks)
   b) With suitable examples explain the following unconditional control statements. i) goto ii) break iii) continue. (10 Marks)

MODULE - III

5. a) Define arrays. Explain compile-time and runtime initialization of single dimensional array. (08 Marks)
   b) Write a C program to calculate standard deviation. (08 Marks)
   c) What is the output of the following program?

   ```c
   Main( )
   { int m[ ]={1, 2, 3, 4, 5};
   int x, y = 0;
   for (x=0; x<5; x++)
       y = y + m [x];
   printf ("%d", y);
   }
   ```
   (04 Marks)

6. a) Define strings, explain with examples declaring and initializing string variables. (04 Marks)
   b) Write a program to copy one string into another and count the number of characters copied. (08 Marks)
   c) List out string-handling functions. Explain any four of them with examples. (08 Marks)
MODULE - IV

7. a) Illustrate the need for user-defined functions. (04 Marks)
b) Explain with suitable examples the elements of user-defined functions. (08 Marks)
c) Write a recursive C function to convert decimal number to its binary equivalent. (08 Marks)

8. a) Define structures. Explain with suitable examples the way structure variables are initialized and structure members are accessed. (04 Marks)
b) Write a program using functions to calculate Binomial co-efficient \[ \frac{n!}{r!(n-r)!} \]. (08 Marks)
c) Describe different categories of functions, with suitable examples. (08 Marks)

MODULE - V

9. a) List out benefits of pointers to the programmers. (06 Marks)
b) Explain with suitable examples declaration and initialization of pointer variables. (06 Marks)
c) Explain basic file operations. (08 Marks)

10. a) Write a program to swap the numbers using pointers. (08 Marks)
b) List out different file I/O functions. Explain any four with suitable examples. (08 Marks)
c) List out errors handling operations in functions. (04 Marks)