# INSTITUTE OF AERONAUTICAL ENGINEERING
### (Autonomous)

**MODEL QUESTION PAPER – I**

Four Year B.Tech I Semester End Examinations, December − 2016

**Regulation: R16**

**LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS**

(Common for all)

**Time: 3 Hours**      **Max Marks: 70**

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**Answer any ONE question from each Unit**
**All questions carry equal marks**
**All parts of the question must be answered in one place only**

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**Unit − I**

1. (a) Find rank by reducing to Echelon form of $\begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 8 & 4 & -3 & -1 \end{bmatrix}$ [7M]

   (b) Find the inverse of $\begin{bmatrix} -2 & 1 & 3 \\ 0 & -1 & 1 \\ 1 & 2 & 0 \end{bmatrix}$ using elementary row operations. [7M]

2. (a) Find rank by reducing to Normal form of matrix $\begin{bmatrix} 2 & -2 & 0 & 6 \\ 4 & 2 & 0 & 2 \\ 1 & -1 & 0 & 3 \\ 1 & -2 & 1 & 2 \end{bmatrix}$ [7M]

   (b) Using LU–decomposition method solve $x + 3y + 8z = 4$, $x + 4y + 3z = -2$, $x + 3y + 4z = 1$ [7M]

**Unit − II**

3. (a) Determine the Eigen values and Eigen vectors of $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ [7M]

   (b) Verify Cayley-Hamilton theorem for $A = \begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ and find $A^{-1}$ [7M]

4. (a) Prove that the Eigen values of a Hermitian matrix are real. [7M]

(b) Diagonalize the matrix $A = \begin{bmatrix} 2 & 2 & -7 \\ 2 & 1 & 2 \\ 0 & 1 & -3 \end{bmatrix}$ by similarity transformation and hence find $A^4$ [7M]

**Unit − III**

5. (a) Solve $x^3 \sec^2 y \frac{dy}{dx} + 3x^2 \tan y = \cos x$ [7M]

(b) If the air is maintained at $25^oC$ and the temperature of the body cools from $100^oC$ to $80^oC$ in 10 minutes, find the temperature of the body after 20 minutes and when the temperature will be $40^oC$ [7M]

6. (a) Obtain the orthogonal trajectories of the family of curves $r(1 + \cos\theta) = 2a$ [7M]

(b) A bacterial culture, growing exponentially, in increases from 200 to 500 grams in the period from 6 am to 9 am. How many grams will be present at noon? [7M]

**Unit − IV**

7. (a) Solve $(D^2 - 4D + 4)y = x^2 \sin x + e^{2x} + 3$ [7M]

(b) Solve by using method of variation of parameters $(D^2 + 1)y = cosec\ x$ [7M]

8. (a) Solve $(D^3 - 6D^2 + 11D - 6)y = e^{-2x} + e^{-3x}$ [7M]

(b) Solve $\left(D^3 - 4D^2 - D + 4\right)y = e^{3x} sin2x$ [7M]

**Unit − V**

9. (a) Verify Rolle's theorem for the function $\log\left(\frac{x^2+ab}{x(a+b)}\right)$ $in\ [a, b],\ a > 0,\ b > 0$ [7M]

(b) Find three positive numbers whose sum is 100 and whose product is maximum. [7M]

10. (a) If $a < b$, prove that $\frac{b-a}{1+b^2} < \tan^{-1}b - \tan^{-1}a < \frac{b-a}{1+a^2}$ using Lagrange's Mean value theorem. Deduce the following. [7M]

    i. $\frac{\pi}{4} + \frac{3}{25} < \tan^{-1}\frac{4}{3} < \frac{\pi}{4} + \frac{1}{6}$
    ii. $\frac{5\pi+4}{20} < \tan^{-1}2 < \frac{\pi+2}{4}$

(b) Prove that $u = x + y + z,\ v = xy + yz + zx,\ w = x^2 + y^2 + z^2$ [7M]

**INSTITUTE OF AERONAUTICAL ENGINEERING**

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MODEL QUESTION PAPER − II

Four Year B.Tech I Semester End Examinations, December − 2016

**Regulation: R16**

**LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS**

(Common for all)

**Time: 3 Hours**      **Max Marks: 70**

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**Answer any ONE question from each Unit**

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**Unit − I**

1. (a) For what value of $K$ such that the matrix $\begin{bmatrix} 4 & 4 & -3 & 1 \\ 1 & 1 & -1 & 0 \\ k & 2 & 2 & 2 \\ 9 & 9 & k & 3 \end{bmatrix}$ has rank 3     [7M]

   (b) Find Inverse by elementary row operations of $\begin{bmatrix} -1 & -3 & 3 & 1 \\ 1 & 1 & -1 & 0 \\ 2 & 5 & 2 & -3 \\ -1 & 1 & 0 & 1 \end{bmatrix}$     [7M]

2. (a) Express the matrix $A$ as sum of symmetric and skew – symmetric matrices.

   Where $A = \begin{bmatrix} 3 & -2 & 6 \\ 2 & 7 & -1 \\ 5 & 4 & 0 \end{bmatrix}$     [7M]

   (b) Solve the system of equations $x + y + z = 1$, $3x + y - 3z = 5$, $x - 2y - 5z = 10$ by using Method of factorization.     [7M]

**Unit − II**

3. (a) Prove that the sum of the Eigen Values of a matrix is equal to its trace and Product of the Eigen Values is equal to determinant.     [7M]

   (b) Diagonalize the matrix $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ -1 & 2 & 2 \end{bmatrix}$     [7M]

4. (a) Prove that the Eigen values of a skew- Hermitian matrix are either zero or purely imaginary. [7M]

(b) Show that $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ satisfies its characteristic equation and hence find $A^{-1}$ [7M]

## Unit − III

5. (a) Solve $[x\frac{dy}{dx} + y = x^3 y^6$ [7M]

(b) A copper ball is heated to a temperature of $80^o c$ and time $t = 0$, then it is placed in water which is maintained at $30^o c$. If at $t = 3$ minutes, the temperature of the ball is reduced to $50^o c$ find the time at which the temperature of the ball is $40^o c$. [7M]

6. (a) Solve $(1 + e^{\frac{x}{y}})dx + e^{\frac{x}{y}}(1 - \frac{x}{y})dy = 0$ [7M]

(b) The number N of bacteria in a culture grew at a rate proportional to N. The value of N was initially 100 and increased to 332 in one hour. What was the value of N after $1\frac{1}{2}$ hours? [7M]

## Unit − IV

7. (a) Solve $\left(D^3 - 4D^2 - D + 4\right)y = e^{3x}cos2x$. [7M]

(b) Solve $y^{11} + 6y^1 + 9y = 0$, $y(0) = -4$, $y^1(0) = 14$. [7M]

8. (a) Solve $\left(D^2 + 3D + 2\right)y = 2\cos(2x + 3) + 2e^x + x^2$. [7M]

(b) Solve $(D^2 + 1)y = \sin x \sin 2x + e^x x^2$. [7M]

## Unit − V

9. (a) Verify mean value Theorem for $f(x) = e^x$. and $g(x) = e^{-x}$ in $[a, b]$. [7M]

(b) Find the maximum and minimum values of $f(x, y) = x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$. [7M]

10. (a) If $u = Tan^{-1}\left[\frac{2xy}{x^2-y^2}\right]$, prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$. [7M]

(b) Show that the functions $u = x+y+z$, $v = x^2+y^2+z^2-2xy-2yz-2xz$ and $w = x^3+y^3+z^3-3xyz$ are functionally related. [7M]

# INSTITUTE OF AERONAUTICAL ENGINEERING
### (Autonomous)

## MODEL QUESTION PAPER – I

Four Year B.Tech I Semester End Examinations, December − 2016
**Regulation: R16**
**COMPUTATIONAL MATHEMATICS AND INTEGRAL CALCULUS**
(Common to CSE, IT, ECE and EEE)

**Time: 3 Hours**                                              **Max Marks: 70**

**Answer any ONE question from each Unit**
**All questions carry equal marks**
**All parts of the question must be answered in one place only**

## Unit − I

1. (a) Find the real root of the equation $x\log_{10}x = 1.2$ by Regula-Falsi method upto three decimal places. [7M]

   (b) Given that $\sin 45^0 = 0.7071$, $\sin 50^0 = 0.7660$, $\sin 55^0 = 0.8192$ and $\sin 60^0 = 0.8660$, find $\sin 52^0$ using Newton interpolation formula. Estimate the error. [7M]

2. (a) Find the root by Newton-Raphson method correct to 4 places of decimals of the equation $3x - \cos x - 1 = 0$. [7M]

   (b) Given $u_1 = 22$, $u_2 = 30$, $u_4 = 82$, $u_7 = 106$, $u_8 = 206$ then find $u_6$ by Lagrange's interpolation formula. [7M]

## Unit − II

3. (a) Derive the Normal Equations of the second degree parabola $y = ax^2 + bx + c$ by the method of least squares. [7M]

   (b) Solve $y' = x + y$, given $y(1) = 0$ to find $y(1.1)$ and $y(1.2)$ by Taylor's series method. [7M]

4. (a) Using the principle of least squares fit an equation of the form $y = ae^{bx}(a > 0)$ to the following data [7M]

| x | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| y | 1.65 | 2.70 | 4.50 | 7.35 |

   (b) Given $y' = x + sin y$, $y(0) = 1$. Compute $y(0.2)$ and $y(0.4)$ by Euler's modified method. [7M]

## Unit − III

5. (a) Evaluate $\int_0^{\log 2} \int_0^x \int_0^{x+\log y} e^{x+y+z}dz\ dy\ dx$. [7M]

   (b) Find the area of the loop of the curve $r = a(1 + \cos\theta)$. [7M]

6. (a) By changing the order of integration, evaluate $\int_0^1 \int_1^{2-x} xy\ dx\ dy$. [7M]

   (b) Find the volume common to the cylinders $x^2 + y^2 = a^2$ and $x^2 + z^2 = a^2$. [7M]

**Unit − IV**

7. (a) Prove that $div\ curl\ \bar{f} = 0$. [7M]

   (b) Evaluate $\int \overline{F} \cdot \overline{n}\ ds$ where $\overline{F} = z\overline{i} + x\overline{j} - 3y^2 z\overline{k}$ and $S$ is the surface $x^2 + y^2 = 16$ included in the first octant between $z = 0$ and $z = 5$. [7M]

8. (a) Find the constants $a$, $b$, $c$ so that the vector $\overline{A} = (x + 2y + az)\,\overline{i} + (bx - 3y - z)\,\overline{j} + (4x + cy + 2z)\overline{k}$ is irrational. Also find $\phi$ such that $\overline{A} = \nabla\phi$. [7M]

   (b) Verify Green's theorem for $\int_c [(xy + y^2)dx + x^2 dy]$ where c is bounded by $y = x$ and $y = x^2$. [7M]

**Unit − V**

9. (a) Show that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$. [7M]

   (b) Prove the relation $xJ_n'(x) = n\ J_n(x) - x\ J_{n+1}(x)$. [7M]

10. (a) Solve in series the equation $\frac{d^2 y}{dx^2} - xy = 0$ about $x = 0$. [7M]

   (b) State and Prove Generating function of Bessel's. [7M]

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# INSTITUTE OF AERONAUTICAL ENGINEERING
## (Autonomous)

**MODEL QUESTION PAPER – II**

Four Year B.Tech I Semester End Examinations, December − 2016
**Regulation: R16**
**COMPUTATIONAL MATHEMATICS AND INTEGRAL CALCULUS**
(Common to CSE, IT, ECE and EEE)

**Time: 3 Hours**                                                                 **Max Marks: 70**

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**Answer any ONE question from each Unit**
**All questions carry equal marks**
**All parts of the question must be answered in one place only**

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### Unit − I

1. (a) Find the real root of the equation $e^x = 3x$ by Bisection method up to 3 decimal places. [7M]

   (b) Fit the polynomial to the data given below using Newton Forward Interpolation formula. [7M]

   | x | 1 | 3 | 5 | 7 | 9 |
   |---|---|---|---|---|---|
   | y | 3 | 14 | 1921 | 23 | 28 |

2. (a) Find by Newton-Raphson method correct to 4 places of decimals of the equation $x^4 - 11x + 8 = 0$. [7M]

   (b) Find $f(1.30)$ by Lagrange's interpolation formulae to the following data. [7M]

   | x | 0 | 1.2 | 2.4 | 3.7 |
   |---|---|-----|-----|-----|
   | y | 3.41 | 2.68 | 1.37 | -1.18 |

### Unit − II

3. (a) Derive the Normal Equations of the straight line $y = ax + b$ by the method of least squares. [7M]

   (b) Solve $y' = xy$, given $y(1) = 0$ to find $y(0.4)$ by Euler's method. [7M]

4. (a) Using the principle of least squares fit an equation of the form $y = ab^x$ to the following data. [7M]

   | x | 2 | 3 | 4 | 5 | 6 |
   |---|---|---|---|---|---|
   | y | 144 | 172.8 | 207.4 | 248.8 | 298.5 |

   (b) Find $y(0.2)$, given that $\frac{dy}{dx} = x + y$, $y(0) = 1$ by Runge - Kutta method. [7M]

### Unit − III

5. (a) Evaluate $\int \int_R xy \, dx \, dy$, where R is the region bounded by the line $x + 2y = 2$, lying in first quadrant [7M]

   (b) Find the area of the loop of the curve $r = a(1 + \cos\theta)$ and outside the circle $r = a$. [7M]

6. (a) By changing the order of integration, evaluate $\int_0^a \int_{x^2/a}^{2a-x} xy^2 \, dy \, dx$. [7M]

(b) Find the volume bounded by the cylinders $x^2 + y^2 = 4$, $y + z = 4$ and $z = 0$. [7M]

**Unit − IV**

7. (a) Prove that $curl \; grad \; \phi = 0$. [7M]

(b) Evaluate $\int \overline{F} \cdot \overline{n} \, ds$ where $\overline{F} = yz\overline{i} + 2y^2\overline{j} + xz^2\overline{k}$ and S is the surface of the cylinder $x^2 + y^2 = 9$ contained in the first octant between $z = 0$ and $z = 2$. [7M]

8. (a) Show that the vector $\overline{F} = (x^2 - yz)\,\overline{i} + (y^2 - zx)\,\overline{j} + (z^2 - xy)\,\overline{k}$ is irrational. Also find the scalar potential $\phi$. [7M]

(b) Verify Stokes theorem for $\overline{F} = (y - z + 2)\,\overline{i} + (yz + 4)\,\overline{j} - xz\overline{k}$ where S is the surface of the cube $x = 0, \; y = 0, \; z = 0, \; x = 2, \; y = 2, \; z = 2$ above the xy-plane. [7M]

**Unit − V**

9. (a) Evaluate [7M]

i. $\int_0^\infty x^6 e^{-4x^2} dx$

ii. $\int_0^\infty x^8 e^{-2x} dx$

(b) Prove the relation $x \, J_n' \, (x) = -n \, J_n \, (x) + x \, J_{n-1} \, (x)$. [7M]

10. (a) Solve in series the equation $\frac{d^2y}{dx^2} + xy = 0$ about $x = 0$. [7M]

(b) State and Prove orthogonality of Bessel's functions. [7M]

**INSTITUTE OF AERONAUTICAL ENGINEERING**

(Autonomous)

**MODEL QUESTION PAPER – I**

Four Year B.Tech I Semester End Examinations, December − 2016
**Regulation: R16**
**ENGINEERING PHYSICS**
**(Common to EEE, ECE, CSE and IT)**

**Time: 3 Hours**                                                    **Max Marks: 70**

**Answer any ONE question from each Unit**
**All questions carry equal marks**
**All parts of the question must be answered in one place only**

**Unit − I**

1. (a) What is electronic polarization? Derive an expression for electronic polarizability in terms of the radius of the atom.                                                                       [10M]

   (b) Write short notes on polarization and dielectric constant related to a dielectric material.   [4M]

2. (a) How would you classify diamagnetic, paramagnetic and ferromagnetic substances based on their magnetic behavior along with examples.                                                        10M]

   (b) If a magnetic field of strength 300 amp/meter produces a magnetization of 4200 $A/m$ in a ferromagnetic material, find the relative permeability of the material.                              [4M]

**Unit − II**

3. (a) Describe the construction of He-Ne laser and discuss its working principle with relevant energy level diagram.                                                                              [10M]

   (b) A semiconductor diode laser has a wavelength of $1.55 \mu m$. Find its band gap in $eV$.        [4M]

4. (a) Explain the principle, construction and working of a semi conductor laser with the help of a suitable diagram.                                                                              [10M]

   (b) State application of lasers in industry, medicine and military.                              [4M]

**Unit − III**

5. (a) What are the two principle factors that cause the properties of nanomaterials to differ from other materials? Discuss in detail these two principle factors.                                   [7M]

   (b) Analyze chemical vapour deposition method of preparing nanomaterials. Give any four applications of nanomaterials in bio fields.                                                             [7M]

6. (a) How do the electrical properties, magnetic properties and mechanical properties of nanomaterials change with size.                                                                         [7M]

   (b) What is the principle behind the TEM? Explain Transmission Electron Microscopy characterization technique of nanomaterials.                                                                 [7M]

**Unit – IV**

7. (a) Illustrate the physical significance of wave function. Derive time independent Schroedinger wave equation for a free particle. [10M]

   (b) If the kinetic energy of the neutron is $0.025eV$, calculate its de Broglie wavelength. (mass of neutron $= 1.674 \times 10^{-27}\ kg$). [4M]

8. (a) What is dual nature of light? Derive the expression for de Broglie wavelength by extending dual nature of light to material particle. [10M]

   (b) An electron is bound in one-dimensional box of size $4 \times 10^{-10}m$. What will be its minimum energy? [4M]

**Unit – V**

9. (a) Estimate the position of fermi level and calculate concentration of electrons in an n-type semi-conductor. [10M]

   (b) Illustrate the effect of doping and temperature on conductivity mechanism of Intrinsic and extrinsic semiconductors. [4M]

10. (a) Derive an expression for carrier concentration of an intrinsic semiconductor . Show that the Fermi level lies at the centre of energy gap. [10M]

    (b) Where does the Fermi level exists in case of p-type and n-type semiconductors at $T = 0K$. [4M]

# INSTITUTE OF AERONAUTICAL ENGINEERING
### (Autonomous)

## MODEL QUESTION PAPER – II

Four Year B.Tech I Semester End Examinations, December − 2016
**Regulation: R16**
**ENGINEERING PHYSICS**
**(Common to EEE, ECE, CSE and IT)**

**Time: 3 Hours**                                                      **Max Marks: 70**

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**Answer any ONE question from each Unit**
**All questions carry equal marks**
**All parts of the question must be answered in one place only**

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## Unit – I

1. (a) Identify different types of polarization mechanism in dielectrics and derive an expression for ionic polarizability in terms of angular frequency. [10M]

   (b) What do you understand by electric susceptibility and displacement vector related to dielectric materials. [4M]

2. (a) Analyze the origin of magnetic moment and find the magnetic dipole moments due to orbital and spin motions of an electron. [10M]

   (b) Find the relative permeability of a ferromagnetic material if a field of strength 220 $A/m$ produces a magnetization 3300 $A/m$ in it. [4M]

## Unit – II

3. (a) Compare the phenomenon of spontaneous emission of radiation with Stimulated emission. [4M]

   (b) Identify Einstein's coefficients with respect to absorption, spontaneous emission and stimulated emission of radiation? Derive relation between them. [10M]

4. (a) With necessary theory and energy level diagram, illustrate the principle, construction and working of a Ruby laser. [10M]

   (b) Calculate the wavelength of emitted radiation from a semiconductor diode laser, which has a band gap of $1.44eV$. [4M]

## Unit – III

5. (a) Write about the origin of nanotechnology and surface to volume ratio of nano particles. [6M]

   (b) What is the principle behind the X-ray diffraction? Explain how XRD can be used for characterization of nanomaterials. [8M]

6. (a) Analyze chemical vapour deposition method of preparing nanomaterials. Give any four applications of nanomaterials in industry. [10M]

   (b) What are nanomaterials? Why do they exhibit different properties? [4M]

**Unit – IV**

7. (a) Comparing waves and particles, explain the concept of matter waves. [4M]

    (b) With support of Davisson and Germer experiment, show that material particle in motion exhibit wave properties. [10M]

8. (a) Estimate the energy of a particle limiting to one dimensional potential well and extend to three dimensions. [10M]

    (b) Show that the wavelength $\lambda$ associated with an electron of mass m and kinetic energy $E$ is given by $\lambda = \frac{h}{\sqrt{2mE}}$ . [4M]

9. (a) What is Hall effect? Show that for a n-type semiconductor the Hall coefficient $R_H = -\frac{1}{ne}$

    (b) Calculate the density of charge carriers of semiconductor, given the Hall efficient is $-6.83 \times 10^{-5} \ m^3/Coulomb$.

10. (a) Estimate the position of fermi level and calculate concentration of holes in an p- type semiconductor. [10M]

    (b) Write notes on direct band gap and indirect band gap semiconductors. [7M]

# INSTITUTE OF AERONAUTICAL ENGINEERING

### (Autonomous)

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**MODEL QUESTION PAPER – I**

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Four Year B.Tech I Semester End Examinations, December − 2016
**Regulation: R16**
**ENGINEERING CHEMISTRY**
(Common for all branches)

**Time: 3 Hours**          **Max Marks: 70**

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**Answer any ONE question from each Unit**
**All questions carry equal marks**
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## Unit – I

1. (a) Derive Nernst equation for a single electrode potential and explain the terms involved in it. What are its applications. [7M]

   (b) Define the specific resistance of a solution? Explain the specific conductance with diagrammatic illustrate of specific conductivity. What are its units? [4M]

   (c) The resistance of $N/2$ solution of an electrolyte in a cell was found to be 50 $ohms$. Calculate the equivalent conductance of the solution, if the electrolyte in cell are 2.2 $cm$ apart and with an area of 3.8 $sq.cm$. [3M]

2. (a) What are the reference electrodes? Describe the construction, working and applications of calomel electrode. [7M]

   (b) Describe the construction, working and applications of Ni-Cd cell. [7M]

   (c) Specific conductance of an electrolyte decreases whereas equivalent conductance increases on dilution Explain? [7M]

## Unit – II

3. (a) Give an account of the various factors influencing corrosion by giving suitable examples. [8M]

   (b) What is oxidation corrosion and how does it takes place? Describe the mechanism of oxidation corrosion. [6M]

4. (a) What is a paint? Explain the constituents and function of a paint. [7M]

   (b) Explain the process of galvanizing and tinning? Mention its applications. [7M]

## Unit – III

5. (a) How do you estimate dissolve oxygen in water? [6M]

   (b) What is meant by sterilization of water? Explain non sterilization of water is carried out by using chlorine and ozone. [6M]

   (c) What is meant by carbonate and non-carbonate hardness of water? Explain with examples. [2M]

6. (a) Describe the ion-exchange process for softening of water? What are its advantages and limitations. [10M]

(b) One liter of water sample collected from a water source in Telangana from Nalgonda has shown the following analysis. $Ca(HCO_3)_2 = 4.86$ *ppm*, $Mg(HCO_3)_2 = 5.84$ *ppm*, $CaSO_4 = 6.86$ *ppm* and $MgSO_4 = 8.4$ *ppm* Calculate temporary and permanent hardness in degree clark. [4M]

## Unit – IV

7. (a) What are elastomers? Give the preparation, properties and applications of Buna-S and Thiokol rubber. [7M]

(b) Explain the difference between thermoplastic and thermosetting resins. [4M]

(c) Define refractories and how they are classified and give the examples. [3M]

8. (a) Write the reaction involved in setting and hardening of cement. [7M]

(b) What are cloud point and pour point. [4M]

(c) What is vulcanization of rubber? How does it improve natural rubber. [3M]

## Unit – IV

9. (a) Explain proximate analysis of coal? How is it carried out. What its significance. [7M]

(b) Define calorific value of fuel. Distinguish gross and net calorific value. [4M]

(c) What are the characteristics of a good fuel. [3M]

10. (a) Explain the refining of petroleum by giving composition, boiling range and uses of various fractions obtained during refining. [7M]

(b) A sample of coal contains the following composition Carbon=84%, Hydrogen=12%, Oxygen=2%, Sulphur=1%, and the remainder being ash. Calculate the gross and net calorific values of the fuel. [4M]

(c) What is octane number and cetane number? Explain their significance. [3M]

# INSTITUTE OF AERONAUTICAL ENGINEERING
### (Autonomous)

**MODEL QUESTION PAPER – II**

Four Year B.Tech I Semester End Examinations, December − 2016
**Regulation: R16**
**ENGINEERING CHEMISTRY**
**(Common for all branches)**

**Time: 3 Hours**                                               **Max Marks: 70**

**Answer any ONE question from each Unit**
**All questions carry equal marks**
**All parts of the question must be answered in one place only**

## Unit − I

1. (a) Explain charging and discharging of lead-acid storage cell with chemical reactions.     [6M]

   (b) What is electrochemical series? Give its applications with suitable examples.     [5M]

   (c) The resistance of $0.1N$ solution of an electrolyte is 40 *ohms*, if the distance between the electrodes is $1.2$ *cm* and area of cross-section is $2.4$ *sq.cm*. Calculate the Equivalent conductance of the solution.     [3M]

2. (a) What are reference electrodes? Explain the construction and functioning of Quinhydrone electrode.     [6M]

   (b) Why the anode of galvanic cell is negative and cathode is positive? Write the different electrode reactions occur at the electrodes.     [5M]

   (c) Discuss the working principles of primary batteries.     [3M]

## Unit − II

3. (a) Explain the electrochemical theory of wet corrosion. Give its mechanism.     [7M]

   (b) What are the different methods employed to control corrosion. Explain cathodic protection method in detail.     [7M]

4. (a) Describe the factors effecting the rate of corrosion by nature of metal.     [6M]

   (b) Explain the process of electroplating with suitable example.     [4M]

   (c) An iron rod partly immersed in water undergoes corrosion near waterline. Give reason     [4M]

## Unit − III

5. (a) What is zeolite? Explain the method for softening of water.     [6M]

   (b) Explain the principle involved in complexometric method for the determination of hardness of water.     [5M]

   (c) What is caustic embrittlement? Explain and also write its prevention.     [3M]

6. (a) Describe the causes and effects of scale and sludge formation.     [6M]

(b) Write short note on the following i) Calgon conditioning ii) Phosphate conditioning [4M]

(c) Calculate the amount of temporary and permanent hardness of water sample which contains the following impurities. $Ca(HCO_3)_2 = 4.86$ ppm, $Mg(HCO_3)_2 = 5.84$ ppm, $CaSO_4 = 6.86$ ppm and $MgSO_4 = 8.4$ ppm [4M]

**Unit – IV**

7. (a) What is condensation polymerization? Write the preparation, properties and applications of Nylon 6 and Bakelite. [7M]

(b) Explain the determination of flash and fire point. [4M]

(c) Write a short note on fiber reinforced plastic? [3M]

8. (a) Explain the mechanism of chain polymerisation. [7M]

(b) What are the ingredients used in compounding of plastics. What are their functions. [4M]

(c) Write the preparation, properties and applications of poly vinyl chloride. [3M]

**Unit – V**

9. (a) What is cracking? Describe the process of Fixed bed catalytic cracking. [7M]

(b) Write an account of the composition, characteristics and applications of CNG and LPG [7M]

10. (a) Explain the ultimate analysis of a solid fuel and its significance. [7M]

(b) Calculate the minimum amount of air required for complete combustion of 1kg of coal sample having the following compositions: C=80%, O=8%, S=2%, H=5%, N=1% and ash=4%. Oxygen in air is 23%by weight. [4M]

(c) Define a fuel? How fuels are classified and give examples. [3M]

# INSTITUTE OF AERONAUTICAL ENGINEERING
### (Autonomous)

**MODEL QUESTION PAPER – I**

Four Year B.Tech I Semester End Examinations, December − 2016
**Regulation: R16**
**COMPUTER PROGRAMMING**
(Common to CSE, ECE, EEE and IT)

**Time: 3 Hours**                                                                 **Max Marks: 70**

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**Answer any ONE question from each Unit**
**All questions carry equal marks**
**All parts of the question must be answered in one place only**

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## Unit − I

1.  (a) Explain various computing environments with neat diagrams.                                      [5M]
    (b) Explain various types of bitwise operators used in C language.                                  [4M]
    (c) Write an algorithm and program to find the average of even numbers between 1 and n.             [5M]

2.  (a) Explain the functional units of computer?                                                       [5M]
    (b) Write an algorithm and draw flowchart for finding greatest among three given numbers.           [5M]
    (c) Write short notes on software.                                                                  [4M]

## Unit − II

3.  (a) Write a C Program to generate all perfect numbers between 1 and n, where n value is supplied
        by the user.                                                                                    [5M]
    (b) Write a C program to print biggest of three numbers.                                            [5M]
    (c) Write a C program to copy one string to another string without using string functions.          [4M]

4.  (a) Explain the syntax of switch statement.                                                         [5M]
    (b) Write C Program to read two matrices and find multiplication of two matrices.                    [5M]
    (c) Write a C program to sort the given array elements in ascending order.                           [4M]

## Unit − III

5.  (a) List out the different types of storage classes with valid example?                             [5M]
    (b) Explain different types of preprocessor directives?                                             [5M]
    (c) Write a C program to illustrate the use of array of pointers.                                    [4M]

6.  (a) Write a C Program to that uses both the recursive and non-recursive functions to generate the
        Fibonacci series numbers below 1000.                                                            [5M]
    (b) Explain parameter passing mechanism's with example.                                             [5M]
    (c) List out the advantages of using pointers and explain generic (void) pointers with suitable example.
                                                                                                        [4M]

**Unit – IV**

7. (a) Differentiate between a structure and union? [5M]

   (b) Write the usage of the following [4M]
      i. Bit fields
      ii. Enumerated types

   (c) Write a program to declare pointer to a structure and display the contents of the structure. Define a structure object of book with three fields: title, author and pages [5M]

8. (a) Explain the following with suitable examples. [5M]
      i. typedef
      ii. Self referential structures

   (b) Explain dynamic memory allocation. [4M]

   (c) Write a C program to read two complex numbers and perform the following: [5M]
      i. Addition of two complex numbers
      ii. Subtraction of two complex numbers

**Unit – V**

9. (a) Describe types of files with an example. [7M]

   (b) Write a C program to replace every 5th character of the data file, using fseek( ) command. [7M]

10. (a) Write the syntax for opening a file with various modes and closing a file. [7M]

   (b) Explain about file handling functions. [7M] [7M]

Hall Ticket No ☐☐☐☐☐☐☐☐☐☐      Question Paper Code: ACS001

## INSTITUTE OF AERONAUTICAL ENGINEERING
### (Autonomous)

#### MODEL QUESTION PAPER – I

Four Year B.Tech I Semester End Examinations, December − 2016
**Regulation: R16**
**COMPUTER PROGRAMMING**
**(Common to CSE, ECE, EEE and IT)**

**Time: 3 Hours**          **Max Marks: 70**

**Answer any ONE question from each Unit**
**All questions carry equal marks**
**All parts of the question must be answered in one place only**

### Unit – I

1. (a) Identify the steps in creating and running a C program? [4M]
   (b) State the properties of an algorithm? Write an algorithm for find the discriminant of a quadratic equation? [5M]
   (c) The straight line method of computing the yearly depreciation of the value of an item is given by

   Depreciation = (Purchase price – Salvage Value ) / Year of service

   Write a C program to determine the salvage value of an item when the purchase price, years of service and the annual depreciation are given [5M]

2. (a) Write the basic structure of a C program with an example? [4M]
   (b) Identify the different symbols used in flowchart? Draw a flowchart for finding the sum of individual digits of a three digit number? [5M]
   (c) For a certain electrical circuit with an inductance L and resistance R, the damped natural frequency is given by

   $$Frequency = \sqrt{\frac{1}{LC} - \frac{R^2}{4C^2}}$$

   Write a C program to calculate the frequency of the electrical circuit? [5M]

### Unit – II

3. (a) Compare and Contrast while and do while loop with example? [4M]
   (b) The following conditions are followed for a student to promote from I year I semester to I year II semester of B.Tech: [5M]
       i. Marks in Engineering Physics $>= 60$
      ii. Marks in Engineering Mathematics $>= 50$
     iii. Marks in Computer Programming $>= 40$
      iv. Total in all three subjects $>= 200$
       v. Total in Engineering Physics and Mathematics $>= 150$
   Given the marks in the three subjects, write a C program to check whether a student is promoted to I year II semester or not.

(c) Write a C program to check whether the given string is palindrome or not without using string functions. [5M]

4. (a) List out any 4 string handling functions with example? [4M]

(b) Write a C program to read two matrices and find the multiplication of two matrices [5M]

$$\begin{array}{ccc} 1 & 2 & 3 \\ 4 & 5 & 6 \end{array} \times \begin{array}{cc} 7 & 8 \\ 9 & 10 \\ 11 & 12 \end{array} = \begin{array}{cc} 58 & 64 \\ 139 & 154 \end{array}$$

(c) Write a C program to print Armstrong numbers between 1 to n where n value is entered by the user. Armstrong number is defined as the sum of cubes of individual digits of a number. e.g. $371 = 3^3 + 7^3 + 1^3$ [5M]

## Unit − III

5. (a) List out the different types of storage classes with valid example? [4M]

(b) Explain different types of preprocessor directives? [5M]

(c) Write a C program that uses functions to convert decimal number to binary number? $(15)_{10} = (1\ 1\ 1\ 1)_2$ [5M]

6. (a) Distinguish between the following: [4M]
    i. Actual and formal arguments
    ii. Scope and visibility of variables

(b) Write a C program to swap two numbers without using third variable by using parameter passing techniques [5M]
    i. Call by value
    ii. Call by reference

(c) Write C programs that use recursive functions to find the $N^{th}$ Fibonacci number. [5M]

## Unit − IV

7. (a) Explain about dynamic memory allocation functions with suitable example? [4M]

(b) Write the usage of the following: [5M]
    i. Unions
    ii. Bit fields
    iii. Enumerated types

(c) Write a C program to maintain a book structure containing name, author and pages as structure members. Pass the address of structure variable to a user defined function and display the contents. [5M]

8. (a) Compare and contrast structures and unions? [4M]

(b) IARE maintains salary details of every employee by storing their name, department, basic pay, da, hra and cca. Write a C program to store this information in a nested structure and display the salary of an employee [5M]

(c) Write a C program to read two complex numbers and perform the following: [5M]
    i. Addition of two complex numbers

ii. Subtraction of two complex numbers

**Unit – V**

9.  (a)  Explain the following file I/O functions with example: [7M]
        i.  fopen()
        ii.  fclose()
        iii.  fread()
        iv.  fwrite()

    (b)  Write a C program to read name and marks of n number of students from user and store them in a file. If the file previously exists, then add the information of n students to the end of existing content. [7M]

10.  (a)  Explain the following functions with suitable example: [7M]
        i.  ftell()
        ii.  fseek()
        iii.  rewind()

    (b)  Write a C program to open a file names INVENTORY and store in it the following data [7M]

| Item | Number | Price | Quantity |
|---|---|---|---|
| Printer | P100 | 7500 | 10 |
| Scanner | S200 | 5500 | 5 |
| Hard disk | H300 | 4500 | 8 |

Read the data from the INVENTORY file and display the inventory table with the value of each item.

[Hint: value = price * quantity and use fprintf() and fscanf() functions]

**INSTITUTE OF AERONAUTICAL ENGINEERING**

(Autonomous)

MODEL QUESTION PAPER – I

Four Year B.Tech I Semester End Examinations, December − 2016
**Regulation: R16**
**ENGLISH FOR COMMUNICATION**
(Common to AE, ME and CE)

**Time: 3 Hours**                                                    **Max Marks: 70**

**Answer any ONE question from each Unit**
**All questions carry equal marks**
**All parts of the question must be answered in one place only**

### Unit − I

1. (a) What is meant by listening? How do you assess a person's listening skills? What are the different barriers of listening? [8M]

   (b) Who is an active listener? How does listening to dialogues differ from listening to conversation? Elaborate. [6M]

2. (a) How many types of listeners are there? Elaborate with examples. Listening is not the same as hearing. Explain. [9M]

   (b) Explain the different stages of Active listening? and how do the gender barriers effect your listening? [5M]

### Unit − II

3. (a) Define a dialogue and Illustrate the various aspects in a dialogue elaborately with practical examples. [6M]

   (b) What is a role play? Explain different types of Role Plays with examples? Differentiate between role play and debate. [8M]

4. (a) What is functional English ? Write ten formal requests (Formal sentences where you request someone to give something to you) to get something from others? [8M]

   (b) What are Speaking Skills? Do you think one must need speaking skills in professional life? Explain in detail. [6M]

### Unit − III

5. Define the following:                                                              [14M]

   (a) Reading skill

   (b) Intensive Reading

   (c) Extensive Reading

   (d) Skimming

   (e) Scanning

6. (a) What is reading comprehension? How do you comprehend a written text? [4M]

   (b) What are the reasons for poor reading comprehension? [4M]

   (c) Define homonyms, homographs and homophones .Give five examples each. [6M]

## Unit – IV

7. What is coherence in paragraph writing? Illustrate briefly about techniques for paragraph development? [5M]

8. What is the difference between a Resume and Curriculum Vitae (CV) Draft a sample cover letter along with CV. [9M]

## Unit – V

9. Explain the following with suitable examples [14M]

   (a) Direct Speech and Indirect Speech

   (b) Word formation

   (c) Active Voice and Passive Voice

   (d) Types of verbs

10. Write about the usage of the following: [14M]

   (a) Articles

   (b) Punctuation

   (c) Will and shall

   (d) Subject and verb agreement

# INSTITUTE OF AERONAUTICAL ENGINEERING
### (Autonomous)

**MODEL QUESTION PAPER – II**

Four Year B.Tech I Semester End Examinations, December − 2016
**Regulation: R16**
**ENGLISH FOR COMMUNICATION**
**(Common to AE, ME and CE)**

**Time: 3 Hours** **Max Marks: 70**

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**Answer any ONE question from each Unit**
**All questions carry equal marks**
**All parts of the question must be answered in one place only**

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## Unit − I

1. (a) Write the difference between listening and hearing. Who is a 'Superficial listener' and explain them with examples? [7M]

   (b) What are the tips to follow during active listening? Give an account of different types of listeners with examples. [7M]

2. (a) Explain about the variations in Indian pronunciation with examples.What is accent neutralization? [6M]

   (b) What are the ways to improve listening comprehension? Discuss the in detail. [8M]

## Unit − II

3. (a) Define speaking and its significance. Narrate your favorite television program [7M]

   (b) Briefly describe various barriers of speaking. [7M]

4. (a) What are the functions of a dialogue? Narrate the celebration of your birthday? [6M]

   (b) What is an oral presentation? Explain the steps/principles to be followed in presenting a paper. [8M]

## Unit − III

5. Write the importance of reading skill? What are the reasons for poor reading? Write in detail about the techniques of reading? [14M]

6. (a) Why reading skill is important? Define four main types of reading techniques? [7M]

   (b) Explain the techniques used in different situations? [7M]

## Unit − IV

7. Explain the essentials of writing skill? Write the format of Curriculum vitae (CV). What is the difference between CV and a Resume? [14M]

8. What does unity refer to in a paragraph? Illustrate briefly about techniques used for paragraph development? [14M]

**Unit – V**

9. Explain the following with suitable examples: [14M]

   (a) Idioms

   (b) Direct Speech and Indirect Speech

   (c) Prepositions

   (d) Tenses

10. Fill up the blanks: [14M]

    (a) Fill up the blanks with suitable articles
        i. Please meet me at the train station in _____ hour from now.
        ii. Can you please go to _____ grocery store on Fifth Street and buy 2 cartons of milk?
        iii. My brother won an award for being _____ best speaker in our college.
        iv. _____ President of India will be visiting Australia next week.
        v. I had _____ fish and chips for dinner.

    (b) Fill up the blanks with suitable verb forms.
        i. Janet _____ karate class every Saturday (attend).
        ii. The eldest brother _____ the family since his father passed away(support).
        iii. The athletes _____ for Canada tomorrow(leave).
        iv. When in season, we _____ mangoes almost every day(eat).
        v. If the weather is fine, we _____ the telematches in the field (hold).

    (c) Fill up the blanks with suitable prepositions.
        i. Jessica is _____ vacation. She is _____ Italy now.
        ii. Look _____ the flowers.
        iii. This dress is very special _____ me.
        iv. Guess what I have _____ my hand?

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# INSTITUTE OF AERONAUTICAL ENGINEERING
### (Autonomous)

**IARE** EDUCATION FOR LIBERATION

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**MODEL QUESTION PAPER – I**

Four Year B.Tech I Semester End Examinations, December − 2016
**Regulation: R16**
**APPLIED PHYSICS**
**(Common to AE, ME and CE)**

**Time: 3 Hours**                                        **Max Marks: 70**

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**Answer any ONE question from each Unit**
**All questions carry equal marks**
**All parts of the question must be answered in one place only**

### Unit – I

1. (a) How polarizability is related with electric dipolmoment? Discuss.  [3M]

   (b) On what factors do the electronic polarization depend? Derive an expression for electronic polarizability in terms of the radius of the atom.  [7M]

   (c) A solid dielectric with density $3 \times 1028$ $atoms/m^3$ shows an electronic polarizability of $10^{-40}$ $farad{-}m^2$. Assuming the internal electric field to be a Lorentz field, calculate the dielectric constant of the material.  [4M]

2. (a) How are magnetization M, applied magnetic field H and flux density are related.  [3M]

   (b) How are dia, para and ferromagnetic substances differ in their properties? Explain their behavior with the help of examples.  [7M]

   (c) If a magnetic field of strength 300 $A/m$ produces a magnetization of 4200 $A/m$ in a ferromagnetic material, find the relative permeability of the material.  [4M]

### Unit – II

3. (a) Discuss basic requirements for a acoustically good hall.  [3M]

   (b) Describe an experimental method to determine the sound absorption coefficient of a material. [7M]

   (c) A hall of volume 85000 $m^3$ is found to have a reverberation time of 2.2 $sec$. If the area of the sound absorbing surface is 7500 $m^2$, calculate average sound absorption coefficient.  [4M]

4. (a) How ultra sonic waves differ from infrasonic waves?  [3M]

   (b) Explain magnetostrictioin methods of producing ultrasonic waves.  [7M]

   (c) A quartz crystal of thickness 0.0001 $m$ is vibrating at resonance. Calculate the fundamental frequency when $Y = 7.9 \times 10^{10}$ $N/m2$ and $\rho = 2650$ $Kg/m^3$.  [4M]

### Unit – III

5. (a) Differentiate between elastic and a rigid body.  [3M]

   (b) Obtain a relation for resultant and concurrent forces in space.  [7M]

(c) If two forces P and Q act on a body at an angle $\theta$ between them. Obtain an equation for resultant forcer $R$. Discuss special cases when $\theta = 0^0$, $\theta = 90^0$ and $\theta = 180^0$. [4M]

6. (a) What are concurrent forces? [3M]

   (b) Explain triangle law of forces. [7M]

   (c) Four forces of 10N, 20N, 25N and 40N are concurrent in space at origin and passing through the points $(3, 2, 5)$; $(1, 7, 4)$; $(4, -2, 4)$ and $(-2, 4, -3)$t respectively. Determine the resultant system of forces [4M]

## Unit – IV

7. (a) State laws of friction. [3M]

   (b) Derive an equation for acceleration of body of mass 'm' sliding down the inclined plane at an angle ' $\theta$' with horizontal. [7M]

   (c) A body of mass M1 placed on rough horizontal plane connected with a string over a frictionless pulley and the second end of the string to connect to M2 suspended vertically down wards. If both the masses moving with uniform acceleration, find tension in the string and also if the horizontal plane is friction less find the tension. [4M]

8. (a) Obtain a relation between angle of friction and coefficient of friction of a body of mass 'm' just sliding on a rough incline plain. [3M]

   (b) Show that pushing of lawn roller requires more force than pulling. [7M]

   (c) Two bodies of masses M1 and M2 connected by a thin mass less string over a pulley. M1 slides up over on inclined plane of $\theta = 0^0$ with horizontal and M2 move vertically down with uniform acceleration. Find the tension in the string for (i) coefficient of friction (ii) friction less inclined plane. [4M]

## Unit – IV

9. (a) State and prove perpendicular axes theorem. [3M]

   (b) Calculate moment of inertia of thin rod of length 'L' and mass 'M'. [7M]

   (c) A thin wheel has moment of inertia 70 $kg - m$ and its diameter is 4.4 $cm$. How much pulling force is to be applied on the thread wound on axle to produce an angular acceleration 0.5 $rad/s$. [4M]

10. (a) Explain basic principle of moment of inertia its applications. [3M]

    (b) State and prove parallel axis theorem. [7M]

    (c) Calculate MI of a rectangular lamina about centroid and perpendicular to it whose mass is 2 $kg$, length 10 $cm$ breadth 4 $cm$ [4M]

# INSTITUTE OF AERONAUTICAL ENGINEERING

### (Autonomous)

### MODEL QUESTION PAPER – II

Four Year B.Tech I Semester End Examinations, December − 2016

**Regulation: R16**

**APPLIED PHYSICS**

**(Common to AE, ME and CE)**

**Time: 3 Hours**                                                        **Max Marks: 70**

**Answer any ONE question from each Unit**
**All questions carry equal marks**
**All parts of the question must be answered in one place only**

## Unit − I

1. (a) How is dielectric constant related with permeability of substances and capacity of capacitors. [3M]

   (b) Define ionic polarizability. On what factors the ionic polarizability depends? Derive an expression for the ionic polarizability. [7M]

   (c) The dielectric constant of He gas is 1.0000684. Find the electronic polarizability of He atoms if the gas contains $2.7 \times 1025 atoms/m^3$. [4M]

2. (a) Obtain a relation between Magnetic induction 'B' Magnetic susceptibility '$\chi$' and Magnetic field intensity. [3M]

   (b) Explain the origin of magnetic moment. Find the magnetic dipole moments due to orbital and spin motions of an electron. [7M]

   (c) Find relative permeability, if $H = 220\ amp/m$ and M=3300 amp/m. [4M]

## Unit − II

3. (a) Mention the relation between reverberation time 'T', absorption coefficient 'a' and surface area 's'. [3M]

   (b) Discuss the factors which are affecting the architectural acoustics and suggest your remedy. [7M]

   (c) The volume of a hall is 475 $m^3$. The area of the wall is 200 $m^2$, area of floor and ceiling each is 100 $m^2$. If the absorption coefficient of the wall, ceiling and floor are 0.025, 0.02 and 0.55 respectively, calculate the reverberation time for the hall. [4M]

4. (a) Write the properties of ultrasonic waves. [3M]

   (b) Describe the piezo-electric method for production of ultrasonic waves. [7M]

   (c) Calculate the velocity of ultrasonic wave of $Y = 7.9 \times 10^{10}\ N/m2\ \rho = 2650 Kg/m^3$. [4M]

## Unit − III

5. (a) Explain the condition for equilibrium of concurrent forces in a plane. [3M]

   (b) Explain the parallelogram law of forces. [7M]

(c) Determine horizontal force P to be applied on the block of weight 1500N to hold it in fixed position on a smooth inclined plane AB of angle angle $30^0$ with the horizontal [4M]

6. (a) State and explain Varignon's theorem with an example. [3M]

   (b) A force of 100N is applied at the top end of a rod AB, placed at $60^0$ with the horizontal. Find the momentum about bottom end A of the rod. [7M]

   (c) A force of 100N is applied at the top end of a rod AB, placed at $60^0$ with the horizontal. Find the momentum about bottom end A of the rod. [4M]

## Unit – IV

7. (a) How are static, dynamic and rolling frictions are different and which one has a maximum and minimum value in magnitude? [3M]

   (b) Give examples to show that friction is both friend and foe. [7M]

   (c) A ladder 7 $m$ long rests against a wall, making $45^0$ with the ground. A man of weight, half of weight of ladder climbs it. At what distance along the ladder will he be, when the ladder is about to slip? Given the coefficient of friction between the ladder and the wall is 1/3 and the ladder and floor is 1/2. [4M]

8. (a) What is limiting friction? [3M]

   (b) Describe the cause of friction. [7M]

   (c) A man weighing 75N stands in the middle of a ladder AB of 25N weight resting on smooth floor at A. The base of the ladder is 2 $m$ away from the wall and the top of the ladder B touches the wall at a height 4m from the ground. The ladder is prevented from slipping by a string OD which makes an angle $30^0$ with horizontal, at the bottom of the wall. The string OD is perpendicular to the ladder. Find the tension in the string. [4M]

## Unit – IV

9. (a) State perpendicular and parallel axis theorem. [3M]

   (b) Derive a relation for moment of inertia of a circular disc (i) along the diagonal (ii) along the perpendicular passing through the centroid [7M]

   (c) Determine MI of about diameter of circular disc of mass 500 $g$ and radius 8 $cm$ [4M]

10. (a) Explain radius of gyration. What is its physical significance? [3M]

    (b) Calculate the moment of inertia of a rectangular lamina of length '$L$', breadth '$b$' and mass '$m$' about an axis passing through centroid (i) from the centroid perpendicular to lamina (ii) at one of the vertex perpendicular to lamina. [7M]

    (c) A thin metal rod mass 40 $g$ is suspended. Calculate the moment of inertia of the rod. [4M]

## INSTITUTE OF AERONAUTICAL ENGINEERING
### (Autonomous)

**MODEL QUESTION PAPER – I**

Four Year B.Tech I Semester End Examinations, December − 2016
**Regulation: R16**
**ENGINEERING DRAWING**
**(Common to AE, ME, CE)**

**Time: 3 Hours**                                                                 **Max Marks: 70**

**Answer any ONE question from each Unit**
**All questions carry equal marks**
**All parts of the question must be answered in one place only**

### Unit − I

1.  (a) Draw a plain scale of R.F 1:40 to read Metres and Decimetres and long enough to measure up to
    8 $m$. Show lengths of 4.3 $m$ and 6.2 $m$ on this scale.                                    [7M]

    (b) Draw the hyperbola when the focus and the vertex are 25 $mm$ apart. Consider eccentricity as
    3/2. Draw a tangent and normal to the curve at a point that is 35 $mm$ from the focus.        [7M]

2.  A circle of 50 $mm$ diameter rolls on the circumference of another circle of 175 $mm$ diameter and outside
    it. Trace the locus of a point on the circumference of the rolling circle for one complete revolution.
    Name the curve. Draw a tangent and a normal to the curve at a point 125 $mm$ from the centre of the
    directing circle.                                                                              [14M]

### Unit − II

3.  A 120 $mm$ long line PQ is inclined at $45^0$ to the HP and $30^0$ to the VP A point m on the line is at a
    distance of 40 $mm$ from p and its front view is 50 $mm$ above the $xy$ line and the top view is 35 $mm$
    below the $xy$ line, Draw its projection. Locate the traces.                                    [14M]

4.  A regular hexagonal lamina with its edge 50 $mm$ has its plane inclined at $45^0$ to HP and lying with
    one of its edges in HP. The plane of one of its diagonals is inclined at $45^0$ to $XY$. The corner nearest
    to VP. is 15 $mm$ in front of it. Draw its projections.                                         [14M]

### Unit − III

5.  A pentagonal pyramid, side of pentagon 30 $mm$ and height 70 $mm$ is resting on HP on one of its base
    edges such that the triangular face containing that edge is perpendicular to HP and parallel to VP
    draw the projections.                                                                          [14M]

6.  A cylinder of diameter 30 $mm$ and axis height 60 mm lying on the ground on a point of its base circle
    such that the axis is inclined at $45^0$ to the H.P and the plane containing the axis males an angle of $30^0$
    with the VP. Draw the projection of the cylinder.                                               [14M]

## Unit – IV

7. A hexagonal prism of base 30 *mm* and height 70 *mm* is resting on its base on the HP with a side of the base perpendicular to the VP. The prism has a cylindrical hole of diameter 40 *mm* drilled centrally such that the axis of the hole is perpendicular to the VP. Draw the development of the lateral surface of the prism. [14M]
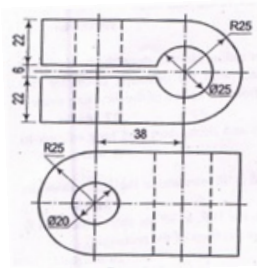
8. Draw the isometric view of Figure 1. [14M]



Figure 1

## Unit – V

9. Draw the following views of the object shown pictorially in Figure 2. [14M]
   (a) Front view
   (b) Top view and
   (c) Side view
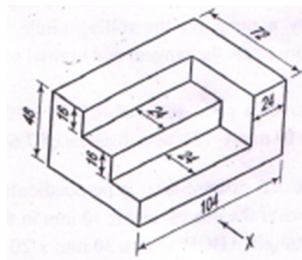


Figure 2

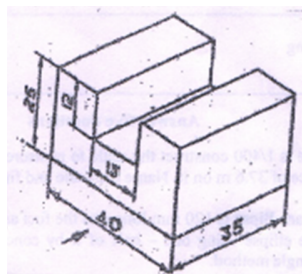10. Draw the elevation, plan and side view of the picture shown in the Figure 3. [14M]



Figure 3

**INSTITUTE OF AERONAUTICAL ENGINEERING**

(Autonomous)

MODEL QUESTION PAPER – II

Four Year B.Tech I Semester End Examinations, December − 2016
**Regulation: R16**
**ENGINEERING DRAWING**
**(Common to AE, ME, CE)**

**Time: 3 Hours**                                                          **Max Marks: 70**

**Answer any ONE question from each Unit**
**All questions carry equal marks**
**All parts of the question must be answered in one place only**

## Unit – I

1. (a) A room of $1728m^3$ volume is shown by a cube of 4 $cm$ side. Find the RF and construct a scale to measure up to 50 $m$. Also indicate a distance of 37.6 $m$ on the scale.                [7M]

   (b) Draw a parabola when span is 80 $mm$ and rise is 30 $mm$ using tangent method.                [7M]

2. A Circle of 50 $mm$ diameter rolls on a horizontal line for a half revolution and then on a vertical line for another half revolution. Draw the curve traced out by point $P$ on the circumference of circle. [14M]

## Unit – II

3. A 70 $mm$ long line $AB$ is inclined at $45^0$ to VP. Its end $A$ lies on HP and 15 $mm$ in front of VP. The top view of line measures 60 $mm$. Draw its projection and determine its inclination with HP. Also locate the traces.                14M

4. A circular lamina of 80 $mm$ diameter rests above HP. on a point A on its circumference. If its plane is inclined at $45^0$ to HP. and the top view of the diameter AC makes an angle of $40^0$ with $xy$ line, draw the projections of the lamina.                [14M]

## Unit – III

5. A hexagonal pyramid of 30 $mm$ side of base and 45 $mm$ length of axis is resting on one of its triangular faces on HP. Draw the projections of the pyramid when its edge inclined at $60^0$ to the VP.                [14M]

6. A pentagonal pyramid, base 25 $mm$ side and axis 50 $mm$ long has one of its triangular faces in the VP and the edge of the base contained by that face makes an angle of $30^0$ with the HP. Draw its projection.                [14M]

## Unit – IV

7. A pentagonal prism, having a base with a 30 $mm$ side and a 70 $mm$ long axis, is resting on its base on HP. such that one of the rectangular faces is parallel to the VP. It is cut by a plane which is inclined at $45^0$ with the reference line and passes through the mid-point of the axis. Draw the development of the lateral surface of the truncated prism.                [14M]

8. A hexagonal prism having base with a 30 *mm* side and a 70 *mm* long axis is resting on its base on the HP. with a side of base parallel to the VP. It is cut by by a plane making an angle of $45^0$ with the HP and bisecting the axis. Draw its isometric projection. [14M]

**Unit – V**

9. Draw the elevation, plan and view from the right for the casting shown in Figure 1. [14M]
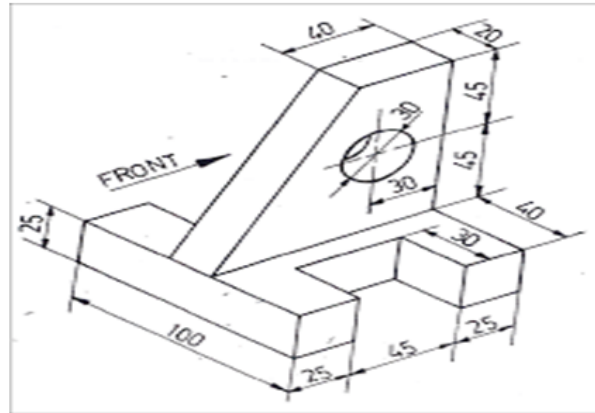


Figure 1

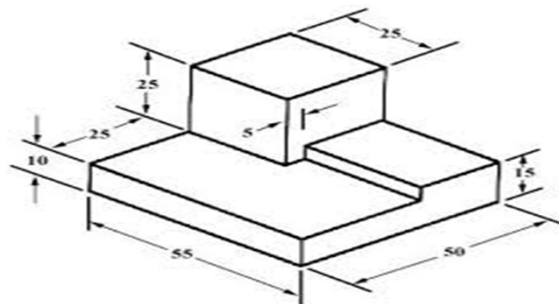10. Draw the front view, top view and left side view of the casting shown in Figure 2. [14M]



Figure 2