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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IARE – R16

ENGLISH FOR COMMUNICATION

[Common for : I Semester (AE, CE and ME) | II Semester (CSE, IT, ECE and EEE)]

Time: 3 Hours

Max Marks: 70

Answer 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) Define the term listening and discuss the various types of listening. [7M]
- (b) Does listening improve interpersonal skills? Give reasons. [7M]
2. (a) Discuss some measures to improve listening habits. [7M]
- (b) What significance does listening skills have in the art of communication? [7M]

UNIT – II

3. (a) Define 'Effective Oral Presentation and its importance in one's professional life. Describe your favourite public speaker's speech. [7M]
- (b) What is the difference between Situational Dialogue & Role Play? Draft a script for a short role play on the theme 'My India'. [7M]
4. Explain how to achieve 'confidence, clarity and fluency' to be effective speakers. Mention some examples. [14M]

UNIT – III

5. (a) How does Reading help to become an excellent communicator? [7M]
- (b) Explain the different techniques of reading. [7M]
6. (a) What are the strategies involved in improving Reading skills. [7M]
- (b) Do you think technology has affected our reading skills? Elaborate your answer. [7M]

UNIT – IV

7. (a) What are the points that you would keep in mind while drafting a piece of writing. [7M]
- (b) Draft a formal email enquiring about a short term course in a foreign university. [7M]
8. (a) Discuss the utility of progress and routine reports in the decision making process of an Organization. [8M]
- (b) Write a short essay on "Reasons and remedies to terrorism". [6M]

UNIT – V

9. (a) Give the meaning and frame a sentence for the following idioms. [8M]
- i. at a stone's throw
 - ii. in black and white
 - iii. to spill the beans
 - iv. a herculean task
- (b) Fill in the blanks in these sentences using the given verbs in the correct tense. [6M]
- i. A: We don't have wheat flour.
B: I _____ some on my way home this evening. (get)
 - ii. At three o'clock tomorrow, I _____ my exam. (write)
 - iii. By June next year, I _____ in this college for two years. (study)
 - iv. A: Are you going to the party tonight?
B: Yes. Don't worry. I _____ you a lift. (give)
 - v. By 10pm tonight, I _____ my assignment. (finish)
 - vi. She _____ for two hours by the time the bus arrives. (wait)
10. (a) Identify the tense of the underlined verbs. [7M]
- i. They went for shopping last week.
 - ii. When he reached the bus stop, the bus had left.
 - iii. Suddenly he remembered where he had hidden the money.
 - iv. Naira was crossing the road when Susan noticed her.
 - v. He had been working with Amazon for nearly two years.
 - vi. I had bought a phone last week.
 - vii. When I arrived at the hall, the film had begun.
- (b) write the usage of the following. [7M]
- i. Articles
 - ii. Active and Passive voice

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS

[Common for : I Semester (all branches)]

Time: 3 Hours

Max Marks: 70

Answer 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) Reduce the matrix $\begin{bmatrix} 1 & 3 & -1 & 2 \\ 0 & 11 & -5 & 3 \\ 2 & -5 & 3 & 1 \\ 4 & 1 & 1 & 5 \end{bmatrix}$ to echelon form and hence find its rank. [7M]

- (b) Using Gauss Jordan method, find inverse of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ [7M]

2. (a) Find the normal form of the matrix $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$ and hence find its rank. [7M]

- (b) Using factorization method solve the equations: [7M]
 $3x+2y+7z=4, 2x+3y+z=5, 3x+4y+z=7.$

UNIT – II

3. (a) Using Cayley -Hamilton theorem, express $A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I$ as a linear polynomial in A where $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ [7M]

- (b) Find the eigen values and corresponding eigen vectors of $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ [7M]

4. (a) If λ is an eigenvalue of a non-singular matrix A, then show that $\frac{|A|}{\lambda}$ is an eigenvalue of adj A. [7M]

- (b) Reduce the matrix $A = \begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$ to a diagonal form. [7M]

UNIT – III

5. (a) Solve $\frac{dy}{dx} - \frac{\tan y}{1+x} = (1+x)e^x \sec y$. [7M]
(b) A body originally at 80° cools down to 60° C in 12 minutes, the temperature of the air being 30° . What will be the temperature of the body after 24 minutes from the original? [7M]
6. (a) Find orthogonal trajectories of family of circles $x^2 + y^2 + 2\lambda x + c = 0$ where λ is parameter. [7M]
(b) Solve $(e^{2y} - y \cos xy) dx + (2xe^{2y} - x \cos xy + 2y) dy = 0$. [7M]

UNIT – IV

7. (a) Solve $(D^2 + 3D + 2)y = e^{e^x}$. [7M]
(b) Solve $y'' + y = \tan x$ by method of variation of parameters. [7M]
8. (a) Solve $(D^2 + 2D + 3)y = e^x \cos x$. [7M]
(b) Solve $(D^4 + 1)y = \sin x$. [7M]

UNIT – V

9. (a) Verify Rolle's theorem for $f(x) = (x+2)^3(x-3)^4$ in $[-2, 3]$. [7M]
(b) If $u = f(r, s)$, $r = x + at$, $s = y + bt$ and x, y, t are independent variables, show that $\frac{\partial u}{\partial t} = a \frac{\partial u}{\partial x} + b \frac{\partial u}{\partial y}$. [7M]
10. (a) If $u = x^2 - 2y^2$, $v = 2x^2 - y^2$, $x = r \cos \theta$, $y = r \sin \theta$ show that $\frac{\partial(u,v)}{\partial(r,\theta)} = 6r^3 \sin 2\theta$. [7M]
(b) A rectangular open box of capacity 32 cubic units is to be prepared. Find the dimensions of the box, to minimize the cost of painting outside. [7M]

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

COMPUTATIONAL MATHEMATICS AND INTEGRAL CALCULUS

[Common for : I Semester (CSE, IT, ECE and EEE) | II Semester (AE, CE and ME)]

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- Use the method of false position to find the fourth root of 32 correct to three decimal places. [7M]
 - By using Newton's forward interpolation formula, find the cubic polynomial which takes the following values. [7M]

X	0	1	2	3
Y	1	2	1	10

- Evaluate a real root of $\cos x + 1 = 3x$ by using Newton Raphson's method. [7M]
 - A curve passes through the point (0,18), (1,10), (3,18) and (6,90). Find the slope of the curve at $x=2$. [7M]

UNIT – II

- Using Taylor series method, find the approximate value of y at $x=0.2$ for the differential equation $y' = 2y + 3e^x$, $y(0) = 0$. [7M]
 - Apply the method of least squares find the straight line that best fits the following data. [7M]

X	1	2	3	4	5
Y	14	27	40	55	68

- Fit a curve of the form $y = a + bx^2$ by the method of least squares for the following data: [7M]

X	1	2.5	3.5	4
Y	3.8	15	26	33

- Find $y(0.1)$ and $y(0.2)$ by Runge-Kutta method of fourth order for the equation, $y' = xy + y^2$, $y(0)=1$. [7M]

UNIT – III

5. (a) By changing the order of integration evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2 dy dx$. [7M]
- (b) Using triple integration find the volume of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. [7M]
6. (a) By changing order of integration evaluate $\int_0^a \int_y^a \frac{x}{x^2+y^2} dx dy = \frac{\pi a}{4}$. [7M]
- (b) Using double integration, compute the area common to $x^2+y^2-4y=0$ and $x^2+y^2-4x-4y+4=0$. [7M]

UNIT – IV

7. (a) Find divergence and curl of $\vec{f} = \text{grad} (x^3 + y^3 + z^3 - 3xyz)$. [7M]
- (b) Evaluate $\iint_S \vec{f} \cdot \hat{n} ds$ where $\vec{f} = i - j + xyzk$ and S is the circular region bounded by cutting the sphere $x^2 + y^2 + z^2 = a^2$ with the plane $y=x$. [7M]
8. (a) Prove that if \vec{r} is a position vector of any point in space then $r^n \vec{r}$ is irrotational. [7M]
- (b) Evaluate by Green's theorem $\oint (y - \sin x) dx + (\cos x) dy$ where C is the triangle enclosed by the lines $y = 0$, $x = \frac{\pi}{2}$, $\pi y = 2x$. [7M]

UNIT – V

9. (a) Prove that [7M]
- i. $\Gamma(n+1) = n\Gamma(n)$.
- ii. $\Gamma(n+1) = n!$.
- (b) Obtain the Series Solution of $\frac{d^2y}{dx^2} + xy = 0$ [7M]
10. (a) Solve the differential equation $y'' + \frac{y'}{x} + (8 - \frac{1}{x^2}) y = 0$. [7M]
- (b) Show that $J_0^2 + 2J_1^2 + 2J_2^2 + 2J_3^2 + \dots = 1$. [7M]

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

COMPLEX ANALYSIS AND PROBABILITY DISTRIBUTION

[II Semester - (Electronics and Communication Engineering)]

Time: 3 Hours

Max Marks: 70

Answer 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) Show that the function $f(z) = \bar{z}$ is continuous at all z but not differentiable anywhere. [7M]
- (b) Find all values of k , such that $f(z) = e^x (\cos ky + i \sin ky)$ is analytic. [7M]
2. (a) If $v(r, \theta) = r^2 \cos 2\theta - r \cos \theta + 2$ find the analytic function $f(z) = u(r, \theta) + i v(r, \theta)$. [7M]
- (b) If $(z) = u + iv$ is analytic prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |\text{Real } f(z)|^2 = 2|f'(z)|^2$. [7M]

UNIT – II

3. (a) Evaluate $\int_C \frac{z+2}{z} dz$ Where C is [7M]
 - i. the upper half of the circle $|z| = 2$ in counter clock wise direction
 - ii. the lower half of the circle $|z| = 2$ in clock wise direction
- (b) Evaluate $\int_C \frac{e^z}{(z-1)(z-4)} dz$, where $C: |z| = 2$. [7M]
4. (a) Evaluate $\int_{1-i}^{2+i} (2x + iy + 1) dz$ along [7M]
 - i. $x = t + 1, y = 2t^2 - 1$
 - ii. Straight line joining the points $1-i$ and $2+i$
- (b) Verify Cauchy theorem for the function $f(z) = Ze^{-Z}$ over the unit circle with Centre as origin. [7M]

UNIT – III

5. (a) Write Laurent's series expansion of $f(z) = \frac{1}{(z^2-4z+3)}$ in powers of for [7M]
 - i. $|z| < 1$
 - ii. $1 < |z| < 3$
- (b) Evaluate $\int_0^{2\pi} \frac{d\theta}{2-\sin\theta}$ by residue theorem. [7M]

6. (a) Find the bilinear transformation which maps the points $z = 1, i, -1$ onto the points $w = i, 0, -i$. [7M]
- (b) Find the poles and residues at each pole of $f(z) = \frac{2z+1}{1-z^4}$. [7M]

UNIT – IV

7. (a) The distribution function of a random variable X is given by, $f(x) = 1 - (1 + x)e^{-x}, x > 0$. Find the density function, mean and Variance. [7M]
- (b) Find the MGF of a random Variable with $p(x) = pq^{x-1}, x = 1, 2, 3, \dots$ and hence find mean and Variance. [7M]
8. (a) A perfect coin is tossed twice. Find the MGF of the number of heads. Find Mean and Variance. [7M]
- (b) Probability density function of a continuous random variable is $f(x) = e^{-x}, x > 0$, find the third moment about the mean. [7M]

UNIT – V

9. (a) It has been claimed that in 60% of all solar heat installations the utility bill is reduced by at least one-third. Accordingly, what are the probabilities that the utility bill will be reduced by at least one-third in [7M]
- i. four of five installations
- ii. at least four of five installations.
- (b) Derive mean of the normal distribution. [7M]
10. (a) The number of telephone lines busy at any instant of time is a binomial Variate with Probability 0.1, that the line is busy. If 10 lines are chosen at random, what is the probability that: [7M]
- i. No line is busy.
- ii. All lines are busy.
- iii. At least one line is busy.
- (b) An air line knows that 5% of the people making reservations on a certain flight will not turn up. Consequently their policy is to sell 52 tickets for a flight that can only hold 50 passengers what is the probability that there will be a seat for every passenger who turns up? [7M]



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Question Paper Code: AHS005



INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

ENGINEERING CHEMISTRY
[Common for : I Semester (all branches)]

Time: 3 Hours

Max Marks: 70

Answer 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 are reference electrodes? Describe the construction and working of Calomel electrode. [6M]
- (b) Define the terms specific, equivalent and molar conductance and explain effect of dilution on them. [8M]
2. (a) What is single electrode potential? Derive Nernst equation for single electrode potential. [6M]
- (b) Describe the construction and working of lead-acid battery with the reactions occurring during discharge. [8M]

UNIT – II

3. (a) Discuss the mechanism of wet corrosion. [7M]
- (b) Explain the anodic metal coating with example. Mention its advantage. [7M]
4. (a) What is paint? Explain the constituents and function of paint. [7M]
- (b) Name and explain the corrosion control method if Mg block are used to protect the corrosion of underground pipeline. [7M]

UNIT – III

5. (a) What is meant by reverse osmosis? Explain the desalination of sea water by reverse osmosis method. [7M]
- (b) 0.28 g of $CaCO_3$ was dissolved in 1 liter of water. 100 ml of this water on titration required 28 ml of EDTA solution. 100 ml of an unknown hard water sample required 33 ml of same EDTA solution. After boiling and filtering 100 ml of the same unknown sample required 10 ml of the same EDTA solution. Calculate total and permanent hardness of water sample. [7M]
6. (a) How do you estimate dissolved oxygen in water? [6M]
- (b) What is potable water? What are the steps taken to obtain pure drinking water? [8M]

UNIT – IV

7. (a) i. Write a detailed note on compounding of plastics. [8M]
ii. What are the important functions of lubricant?
- (b) What are the draw backs of natural rubber? Explain the vulcanization process. [6M]
8. (a) What are fibers? Write a note on natural fibers and their modification. [7M]
- (b) i. Distinguish between thermo and thermosetting plastics. [7M]
ii. Give reason: PVC is soft and flexible, where as Bakelite is hard and brittle.

UNIT – V

9. (a) What is cracking of petrol? Explain fixed bed catalytic cracking process. [7M]
- (b) What is calorific value? Explain octane and cetane numbers. [7M]
10. (a) A sample of coal has 5% hydrogen when allowed to undergo combustion. The following data: weight of coal = 0.95 g, weight of water = 700 g, water equivalent weight = 2000 g, rise in temperature = $2.4^{\circ}C$. Calculate GCV and NCV of sample. Latent heat of steam = 2454 kJ/kg, specific heat = $4.2 \text{ kJ/kg}^{\circ}C$ [7M]
- (b) What is knocking? Explain the mechanism of knocking with relevant equations. [7M]

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

ENGINEERING PHYSICS

[Common for : I Semester (CSE, IT, ECE and EEE)]

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- Define the terms dipole moment and polarization. Discuss the different polarizations mechanisms in dielectrics. [8M]
 - If a NaCl crystal is subjected to an electric field of 1000 V/m and the resulting polarization is $4.3 \times 10^{-8} C/m^2$, calculate the dielectric constant of NaCl. [6M]
- What is internal field? Derive an equation for internal field in case of one dimensional array of atoms in dielectric solids. [8M]
 - A silicon material is subjected to a magnetic field of strength 1000 A/m. If the magnetic susceptibility of silicon is -0.3×10^{-5} , calculate its magnetization. Also evaluate the magnetic flux density of the field inside the material. [6M]

UNIT – II

- Obtain an expression for energy density of radiation under equilibrium condition in terms of Einstein coefficients. [8M]
 - Explain the three major engineering applications of laser. [6M]
- Explain the construction of He-Ne laser with neat diagram. Discuss its working in detail with energy level diagram. [8M]
 - Calculate the energy difference in eV between the two energy levels of Neon atoms of He-Ne laser if the transition between these levels results in emission of light of wavelength $\lambda = 632.8 \text{ nm}$ [6M]

UNIT – III

- What are nanomaterials? Explain their electrical and magnetic properties. [7M]
 - Explain briefly quantum confinement nature of nano materials. [7M]
- Explain qualitatively why nanomaterials are significantly different from bulk materials of the same chemical composition. [7M]
 - Explain briefly chemical vapour deposition method of fabrication of nano materials with neat sketch. [7M]

UNIT – IV

7. (a) What are the properties of wave functions? Obtain the expression energy Eigen values an energy functions for a practice in one dimensional potential well of infinite height. [7M]
- (b) What are matter waves? Derive the expression for de-Broglie wavelength. [7M]
8. (a) Describe Davisson and Germer experiment to verify matter waves. [7M]
- (b) An electron is bond in one dimensional potential well of width 0.12 nm. Find the energy values in the ground state and also the first two excited state in eV. [7M]

UNIT – V

9. (a) Define Fermi level in case of semiconductors and mention its position in intrinsic and extrinsic semiconductors at 0 K. [7M]
- (b) The effective density of states for electrons and holes in silicon at 300 K are: $2.8 \times 10^{19} \text{ cm}^{-3}$ and $1.04 \times 10^{19} \text{ cm}^{-3}$ respectively. The energy gap is 1.1 eV. Calculate the intrinsic carrier concentration at 450 K. [7M]
10. (a) State and explain Hall effect and derive the expression for Hall coefficient. [8M]
- (b) A silicon plate of thickness 1mm, breadth 10mm and length 100mm is placed in a magnetic field of 0.5 wb/m^2 acting perpendicular to its thickness. If 10^{-2} A current flows along its length, calculate Hall voltage developed if Hall coefficient is $3.66 \times 10^{-4} \text{ m}^3/\text{coulomb}$. [6M]



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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

APPLIED PHYSICS

[Common for : I Semester (AE, ME and CE)]

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- What is electronic polarization? Show that electronic polarisability is directly proportional to the cube of the radius. [8M]
 - The electronic polarizability of He gas is $2.243 \times 10^{-41} Fm^2$. If the gas contains 2.7×10^{25} atoms per m^3 at NTP, calculate dielectric constant of He gas. [6M]
- Classify different magnetic materials diamagnetic, paramagnetic and ferromagnetic based on their magnetic moments. Discuss different properties exhibited by them with examples. [8M]
 - A paramagnetic material has a magnetic field intensity of 10^4 A/M. If the susceptibility of the material at room temperature is 3.7×10^{-3} , calculate the magnetization and flux density in the material. [6M]

UNIT – II

- What is absorption coefficient? What is its unit? Derive an expression for absorption coefficient of a material. [8M]
 - The volume of a room is $1200 m^3$. The wall area of the room is $220 m^2$, the floor area is $120 m^2$ and ceiling area is $120 m^2$. The average sound absorption coefficient [6M]
 - for wall is 0.03,
 - for ceiling 0.80 and
 - for floor is 0.06.

Calculate the average sound absorption coefficient and reverberation time of the room.
- What is piezo electric effect? Explain how it is useful in the construction of an ultrasonic oscillator. Give some of the uses of ultrasonic wave. [8M]
 - A piezo electric crystal has a thickness 0.002 m. If the velocity of sound wave in crystal is 5750 m/s, calculate the fundamental frequency of crystal. [6M]

UNIT – III

5. (a) State Lami's theorem, which gives condition of equilibrium of three coplanar force systems. Also prove this theorem. [8M]
- (b) Three forces acting at a point are in equilibrium. If they make angles of 120° with one another, show that they are equal. [6M]
6. (a) State the triangle law of forces. A car accelerates uniformly from rest and acquires a speed of 36 km/h in 10 sec. Calculate [7M]
- the acceleration
 - total distance travelled
 - the speed at the end of 5^{th} second
 - the distance travelled in 5^{th} second.
- (b) Discuss the couple, considering the two parallel coplanar forces of system. [7M]

UNIT – IV

7. (a) What is limiting friction? A block is placed on an inclined plane. The plane is then raised until it makes an angle α with the horizontal. If μ for block and plane is 0.3. Find value of angle α to which the plane may be raised before the block begins to slide. [7M]
- (b) Derive the relation between angle of friction and coefficient of friction. [7M]
8. (a) A body of mass m slides down a rough inclined plane at an angle θ with horizontal. If μ_k is the coefficient of kinetic friction then find an expression for the acceleration of the body. [7M]
- (b) A block slides down an inclined plane of angle 30° with horizontal with an acceleration $g/4$. Find the coefficient of kinetic friction. [7M]

UNIT – V

9. (a) A circular disk has mass of 1 kg and diameter of 15 cm. Calculate its moment of inertia about a tangent perpendicular to the plane and a diameter. [7M]
- (b) Obtain an expression for moment of inertia rectangular lamina about axis passing through its centre and parallel to one of the side. [7M]
10. (a) State and prove theorem of perpendicular axis. [6M]
- (b) A flywheel is a uniform disc of mass 72 Kg and radius of 50 cm. calculate [8M]
- Moment of inertia.
 - its kinetic energy when it is rotating at 70 r.p.m.



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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IARE – R16

MODERN PHYSICS

[Common for : II Semester (AE, ME and CE)]

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- Illustrate FCC crystal structure. Distinguish between SC and BCC crystal structures. [7M]
 - Show that the maximum radius of the sphere that can just fit into the void at the body center of FCC structure coordinated by the facial atoms is $0.414 r$ where r is the radius of the atom. [7M]
- Derive an expression for the interplanar spacing between two adjacent planes of Miller indices $(h k l)$ in a cubic lattice of edge length 'a'. [7M]
 - Explain the unit cell and bravias lattice with neat figures. Sketch the following plane in a cubic unit cell $(1 1 2)$, $(1 2 1)$, $(1 0 1)$. [7M]

UNIT – II

- Describe with suitable diagram the powder method of determination of crystal structure. [7M]
 - A beam of X-rays of wavelength 0.071 nm is diffracted by (110) plane of rock salt with lattice constant of 0.28 nm . Find the glancing angle for the second order diffraction. [7M]
- What is Burger's vector? Distinguish between edge dislocation and screw dislocation. [7M]
 - What is the angle at which the third order reflection of X-rays of 0.79 \AA wavelength can occur in a calcite crystal of $3.08 \times 10^{-8} \text{ cm}$ spacing? [7M]

UNIT – III

- Explain the construction and working of a semiconductor diode laser. [7M]
 - Calculate the ratio of the stimulated emission rate to the spontaneous emission rate for an incandescent lamp operating at a temperature of 1000K assuming the average operating wavelength to be $0.5 \mu\text{m}$. [7M]
- Explain the three major engineering applications of laser. [7M]
 - What are principles of sensors. Find the ratio of population of two energy levels in a laser if the transition between them produces light of wavelength 694.3nm . Assume the ambient temperature to be 27°C . [7M]

UNIT – IV

7. (a) What is the principle of optical fiber? Distinguish between Step index and graded index fibers. [7M]
- (b) Calculate the refractive indices of core and cladding materials of an optical fiber if its numerical aperture is 0.22 and relative refractive index difference is 0.012. [7M]
8. (a) What is attenuation? Explain the factors contributing to the fibers loss. [7M]
- (b) Define the terms [7M]
- i. refractive index of profile.
 - ii. fractional index change.
 - iii. angle of acceptance.
 - iv. The refractive indices of core and cladding are 1.5 and 1.48 respectively in an optical fibre. Find the numerical aperture and angle of acceptance.

UNIT – V

9. (a) Explain interference in thin films and obtain conditions for bright band and dark band. [7M]
- (b) Newton's rings are observed in the reflected light of wavelength 5000 \AA . The diameter of the 10^{th} dark ring is 0.5 cm. Find the radius of curvature of the lens used. [7M]
10. (a) Obtain an expression for the radius of the n^{th} dark ring in case of Newton rings. [7M]
- (b) In a grating show that only first order is possible if the width of the grating element is less than twice the wavelength of light. [7M]



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Question Paper Code: AHS009



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

ENVIRONMENTAL STUDIES

[Common for : II Semester (all branches)]

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- (a) Explain the components of environments with the help of neat sketch. [7M]
(b) Describe the importance of ecology and eco-system with examples. [7M]
- (a) What is an ecosystem? Explain the structures and functions of ecosystem. [7M]
(b) Briefly explain the types of ecological pyramids with energy flow. [7M]

UNIT – II

- (a) What are the major causes and consequences of deforestation? [7M]
(b) Discuss the impact of over exploitation of mineral resources. [7M]
- (a) Give a brief account of renewable and non-renewable energy resources. [7M]
(b) What happens to forest and tribal people if number of dams increases in our environment? [7M]

UNIT – III

- (a) Substantiate that INDIA is a mega biodiversity nation. Elaborate. [7M]
(b) Explain the reasons for threats to biodiversity. [7M]
- (a) What is Biodiversity? Give its significance. What are the three types of biodiversity? Explain them. [7M]
(b) Explain in-situ and on-situ conservation along with merits and limitations. [7M]

UNIT – IV

- (a) Write a short note on Global warming and ozone depletion. [7M]
(b) Explain the sources, effects and control of air pollution. [7M]
- (a) Explain solid waste management. Mention the affects of solid waste pollution. [7M]
(b) Mention the causes and effects of water pollution. Explain strategies to tackle them. [7M]

UNIT – V

9. (a) Define EIA. Point out the significance and various stages of EIA. [7M]
(b) Explain the main objectives and provisions of water pollution act. [7M]
10. (a) Explain the characteristics of population growth. [7M]
(b) Explain biomedical waste management and handling rule 2016. [7M]

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INSTITUTE OF AERONAUTICAL ENGINEERING (Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

PROBABILITY AND STATISTICS [Common for : II Semester (CSE and IT)]

Time: 3 Hours

Max Marks: 70

Answer 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) The probability function (discrete random variable) for a random variable X is [7M]

$$f(x) = \begin{cases} 2k, & x = 10 \\ k, & x = 20 \\ k - 0.2, & x = 30 \\ 0, & \text{otherwise} \end{cases} \quad \text{where } k \text{ is some constant.}$$

- i. k
ii. $P(X > 15 \text{ or } X < 40)$

- (b) The probability density function for a continuous random variable X is [7M]

$$f(x) = \begin{cases} \frac{x+2}{18}, & -2 < x < 4 \\ 0, & \text{otherwise} \end{cases}$$

- i. $E(X)$
ii. $Var(X)$

2. (a) In an intelligence test administered on 1000 children, the average was 60 and a standard deviation of 20. Assuming that the marks obtained by the children follow a normal distribution find the number of children who have scored. [7M]

- i. more than 90 marks
ii. below 40 marks
iii. between 50 and 80 marks

- (b) Prove that mean and Variance of Poisson distribution are same. [7M]

UNIT – II

3. (a) Let $f(x, y) = be^{-x} \cos(y)$, $0 \leq x \leq 2$; $0 \leq y \leq \pi/2$; and $f(x, y) = 0$, all other x and y be a valid joint probability density function of two random variables X and Y then find b. [7M]

- (b) Obtain the rank correlation coefficient for the following data: [7M]

X:	68	64	75	50	64	80	75	40	55	64
Y:	62	58	68	45	81	60	68	48	50	70

4. (a) Two random variables X and Y have the following joint probability density function [7M]

$$f(x, y) = \begin{cases} 2 - x - y; & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

Find marginal density functions of X and Y

- (b) Find a least square regression line of X on Y for the following data: [7M]

X	1	3	8	10	13
Y	80	100	110	120	140

UNIT – III

5. (a) Determine all possible samples of size 2 without replacement from a population consisting of 3, 6, 9, 12, 15 and find mean and variance of sampling distribution of means. [7M]
- (b) A certain brand of tires has a mean life of 25,000 miles with a standard deviation of 1600 miles. What is the probability that the mean life of 64 tires is less than 24,600 miles? [7M]
6. (a) A survey was conducted in a slum locality of 2000 families by selecting a sample of size 800. It was revealed that 180 families were illiterates. Find the probable limits of illiterates' families in the population of 2000? [7M]
- (b) The mean of a certain population is equal to the standard error of the distribution of means of samples of size 100 drawn from that population. Find the probability that the mean of the sample of size 25 from the population will be negative? [7M]

UNIT – IV

7. (a) A sample of 900 members has a mean 3.4 cms, and standard deviation 2.61 cms. Is the sample from population of mean 3.25 cm and standard deviation 2.61 cms.? [7M]
- (b) In a year there are 956 births in a town A, of which 52.5% were males, while in towns A and B combined this proportion in a total of 1406 births was 0.496. Is there any significant difference between in the proportion of male births in two towns? [7M]
8. (a) A coin was tossed 400 times and the head turned up 216 times. Test the hypothesis that the coin is unbiased at 5% Level of Significance. [7M]
- (b) Random sample of 1000 engineering students from a city A and 800 from city B were taken. It was found that 400 students in each of the sample were from Payment quota. Does the data reveal a significant difference between the two cities in respect of Payment quota students? Test at 99% Level of Significance. [7M]

UNIT – V

9. Fit a poisson distribution to the following data and test the goodness of fit. [14M]

x	0	1	2	3	4	5	6
y	275	72	30	7	5	2	1

10. (a) Two samples of size 9 and 8 gave the sum of the squares of deviations from their respective means equal to 160 and 91 respectively. Can they be regarded as drawn from the same population?

[7M]

(b) A completely randomized design experiment with 10 plots and 3 treatments are as follows: [7M]

Plot No:	1	2	3	4	5	6	7	8	9	10
Treatment:	A	B	C	A	C	C	A	B	A	B
Yield:	5	4	3	7	5	1	3	4	1	7

Analyze the results for treatment effects.

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

MATHEMATICAL TRANSFORM TECHNIQUES

[II Semester - (Electrical and Electronics Engineering)]

Time: 3 Hours

Max Marks: 70

Answer 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) Obtain the Fourier series for in $f(x) = 1 - x^2$ in $(-1,1)$. [7M]
- (b) Determine the half range sine series in $f(x) = e^x$ in $(0,1)$. [7M]
2. (a) Determine the Fourier series for $f(x) = |x|$ in $(-\pi, \pi)$. [7M]
- (b) Obtain the half range sine series $f(x) = x^2$ in $(0,4)$. [7M]

UNIT – II

3. (a) Express $f(x) = \begin{cases} 1 & \text{for } 0 \leq x \leq \pi \\ 0 & \text{for } x > \pi \end{cases}$ as Fourier sine integral and hence evaluate $\int_0^{\infty} \frac{1-\cos(\pi\lambda)}{\lambda} \sin(x\lambda) d\lambda$. [7M]
- (b) Determine the Fourier cosine transform of $f(x) = \begin{cases} \cos x & \text{for } 0 < x < 1 \\ 0 & \text{for } x > 1 \end{cases}$ [7M]
4. (a) Find the Fourier cosine transform of $f(x) = \begin{cases} x, & \text{for } 0 < x < 1 \\ 2 - x, & \text{for } 1 < x < 2 \\ 0, & \text{for } x > 2 \end{cases}$ [7M]
- (b) Determine the inverse Fourier transform $f(x)$ of $f(p) = e^{-|p|y}$ [7M]

UNIT – III

5. (a) Find the Laplace transform of the full wave rectifier function defined by $f(t) = E \sin \omega t$ for $0 < t < \frac{\pi}{\omega}$ having period $\frac{\pi}{\omega}$. [7M]
- (b) Find the Laplace transform of $\sinh 3t \cos^2 t$. [7M]
6. (a) Find $L^{-1} \left\{ S \log \left(\frac{S+4}{S-4} \right) \right\}$. [7M]

- (b) Using Convolution, find $L^{-1} \left\{ \frac{4S+5}{(S-1)^2(S+2)} \right\}$. [7M]

UNIT – IV

7. (a) Find the Z - transform of $\sin(3n + 5)$. [7M]
(b) If the Z -transform of U_n is $\frac{2z^2+3z+4}{(z-3)^3}$, compute U_1 and U_2 . [7M]
8. (a) Using convolution theorem, determine the inverse Z- transform of $\frac{z^2}{z^2-8z+12}$. [7M]
(b) Using Z - transform, determine the response of the system $u_{n+2} - 5u_{n+1} + 6u_n = 1$ with $u_0 = 0, u_1 = 1$. [7M]

UNIT – V

9. (a) Solve the partial differential equation $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$. [7M]
(b) Solve $y \frac{\partial u}{\partial x} + x \frac{\partial u}{\partial y} = 3u$ and $u(x, 0) = e^{x^2}$ by the method of separation of variables. [7M]
10. (a) Using Charpit's method, solve $2x(z^2q^2 + 1) = pz$. [7M]
(b) Find the solution of the wave equation subjected to the conditions. $y = P_0 \cos Pt, x = l$. [7M]
 $y = 0, x = 0$

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IARE – R16

COMPUTER PROGRAMMING

[Common for : I Semester (CSE, IT, ECE and EEE) | II Semester (AE, CE and ME)]

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- (a) Draw and explain the structure of C program. [7M]
(b) List the basic data types used in C and give their sizes. [7M]
- (a) Draw a flow chart to find the GCD of two numbers. (Don't use division and mod operations). [7M]
(b) List all the operators in C along with their precedence and associativity. [7M]

UNIT – II

- (a) Develop a C program to read two matrices A and B and perform matrix multiplication on the given matrices. [7M]
(b) Sorting an Array of Integers into Ascending Order. [7M]
- (a) Write a C program that calculates the sum of the digits of an integer. [7M]
(b) Write a C program to find Power of a Number (i.e. X^Y – where x and y are inputs) without using built in functions. [7M]

UNIT – III

- (a) Using an example compare the declarations `char a[]` and `char *a`. [5M]
(b) Write a single program to demonstrate the Call By Value and Call By Reference functions by taking an example of swapping the values of two variables. [9M]
- (a) List the four categories of functions and explain them briefly. [8M]
(b) Write a C program to read a text and print the number of characters and words in it (Use pointers). [6M]

UNIT – IV

- (a) Write short notes on enumerated data type in C. [4M]
(b) Write a program in C to store and display the information of 10 students using structure. [10M]

8. (a) Explain the usage of typedef with an example. [6M]
(b) Differentiate between structure and union. [8M]

UNIT – V

9. (a) Explain command line arguments with an example. [5M]
(b) Write a C Program to Compare two text/data files. [9M]
10. (a) Narrate the reasons for a file cannot be opened? [6M]
(b) Write a C Program to Reverse the Contents of a File and Print it. [8M]

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IARE – R16

DATA STRUCTURES

[Common for : II Semester (CSE, IT, ECE and EEE)]

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- (a) What is selection sort? State the process and sort the following set of elements using this technique: 20,35,40,100,3,10,15. [7M]

(b) Write a recursive algorithm for finding solution to the Tower's of Hanoi problem. Explain the working of your algorithm (with 3 disks) with diagrams. [7M]
- (a) An array A contains n unique integers from the range x to y (x and y inclusive where $n=y-x$). That is there is one member that is not in A. Design an $O(n)$ time algorithm for finding that number. [7M]

(b) What are the characteristics of a good algorithm? What is the relation between the time and space complexities of an algorithm? [7M]

UNIT – II

- (a) Suppose a queue is housed in an array in circular fashion. Write a procedure ENQ to add a new item into the above house. And also check whether the queue is full. Write another procedure DEQ to delete an element from the queue after checking queue empty status. [8M]

(b) Write an algorithm to evaluate a postfix expression. Execute your algorithm using the following postfix expression as your input: a b + c d +*f. [6M]
- (a) Using stacks, write an algorithm to determine whether the infix expression has balanced parenthesis or not. [7M]

(b) Illustrate the steps for converting an infix expression into a postfix expression for the following expression $(a + b) * (c + d) / (e + f)$. [7M]

UNIT – III

- (a) Implement a Queue using a singly linked list L. The operations INSERT and DELETE should still take $O(1)$ time. [9M]

(b) Write a function to reverse the links in a linked list such that the last node becomes the first and the first becomes the last by traversing the linked list only once. [5M]

6. (a) If x is a pointer to a node in a doubly linked list, then $x \rightarrow \text{prev}$ is the pointer to the node before it and $x \rightarrow \text{next}$ is the pointer to the node after it. What does this pair of statements, executed in order, do? [7M]

$(x \rightarrow \text{next}) \rightarrow \text{prev} = x \rightarrow \text{prev};$
 $(x \rightarrow \text{prev}) \rightarrow \text{next} = x \rightarrow \text{next};$

If we then execute this pair of statements (after executing the first pair of statements), what happens?

$(x \rightarrow \text{next}) \rightarrow \text{prev} = x;$
 $(x \rightarrow \text{prev}) \rightarrow \text{next} = x;$

Visualize the both conditions using diagrammatic representation.

- (b) Let P be a pointer to a circularly linked list. Show how this list may be used as a queue. That is, write algorithms to add and delete elements. Specify the value for P when the queue is empty and show using diagrammatic representation. [7M]

UNIT – IV

7. (a) Draw a picture of the directed graph, Where graph G is defined as [7M]

$G = (V, E)$

$V(G) = \{1, 2, 3, 4, 5, 6\}$

$E(G) = \{(1,2), (2, 3), (3, 4), (5,1), (5, 6), (2, 6), (1, 6), (4, 6), (2, 4)\}$

Obtain the following for the above graph:

- i. Adjacency matrix.
- ii. Reachability matrix.

- (b) A binary tree T has 9 nodes. The in order and preorder traversals of T yield the following sequence of nodes. [7M]

In Order: EACKFHDBG

Pre Order:FAEKCDHGB

Draw the tree T . Also give the yield of the Post Order traversal.

8. (a) Explain various graph traversal schemes and write their merits and demerits. [6M]
 (b) What is a binary tree? Write an algorithm for the preorder traversal of a binary tree using stacks. [8M]

UNIT – V

9. (a) Suppose that a Binary Search Tree is constructed by repeatedly inserting distinct values in to the tree. Argue that the number of nodes examined in searching for a value in the tree is one plus the number of nodes examined when the value was first inserted in to the tree. [7M]

- (b) The following values are to be stored in a hash table [7M]

25, 42, 96, 101, 102, 162, 197, 201

Use division method of hashing with a table size of 11. Use sequential method of resolving collision. Give the contents of array.

10. (a) Create B-Tree of order 5 from the following list of data items: [7M]

20, 30, 35, 85, 10, 55, 60, 25. What will be the root note for the above B-Tree.

- (b) Draw the 11-item hash table resulting from hashing the keys 12, 44, 13, 88, 23,94, 11, 39, 20, 16 and 5 using the hash function $h(i) = (2i+5) \bmod 11$. [7M]



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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

FUNDAMENTAL OF ELECTRICAL AND ELECTRONICS ENGINEERING

[Common for : II Semester (CSE and IT)]

Time: 3 Hours

Max Marks: 70

Answer 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) State and explain Faraday's laws of Electromagnetic Induction? [6M]
- (b) For the network shown in Figure 1, find all the branch currents and voltage drops across all resistors. [8M]

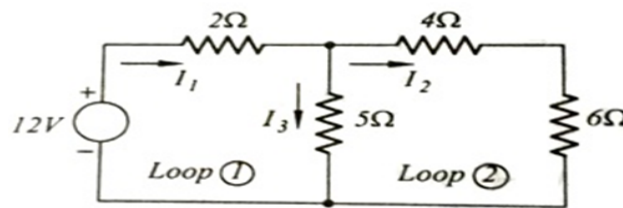


Figure 1

2. (a) Derive the expression for the voltage across capacitor and prove that the energy stored in the capacitor $E_c = \frac{1}{2} CV^2$ [7M]
- (b) Derive an expression for finding the equivalent capacitance when 'n' capacitors are connected in series. [7M]

UNIT – II

3. (a) Using nodal analysis, find the voltage across BC and the current in the 12V source for the circuit shown in Figure 2. [7M]

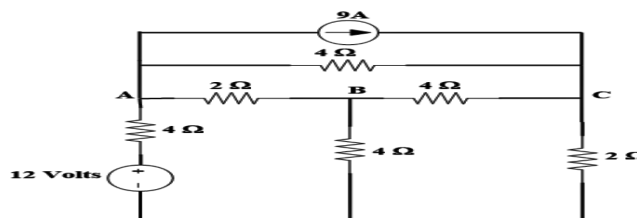


Figure 2

- (b) State and explain Tellegen's theorem and superposition theorem with an example. [7M]
4. (a) Prove that the maximum power could be transferred only when load resistance equals Thevenin's resistance [7M]
- (b) Determine the current through 6 ohm resistance connected across A-B terminals in the circuit shown in Figure 3 using Thevenin's theorem. [7M]

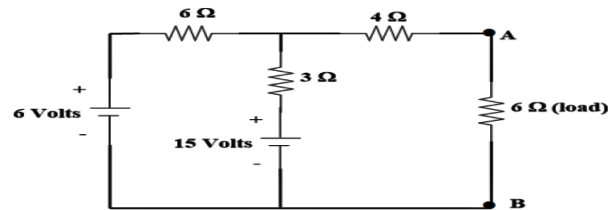


Figure 3

UNIT – III

5. (a) Two impedances $(5+j31.4)$ and $(50+j4.71)$ are connected in parallel across a 230V, 50Hz supply. Calculate the branch currents, total current drawn from the supply and the total power consumed. [7M]
- (b) Show that two watt meters are sufficient to measure the total power in a balanced three phase system. Draw the phasor diagram. [7M]
6. (a) Determine the equivalent resistance between 'X' & 'Y' for the network shown in Figure 4 using star – delta transformation. [8M]

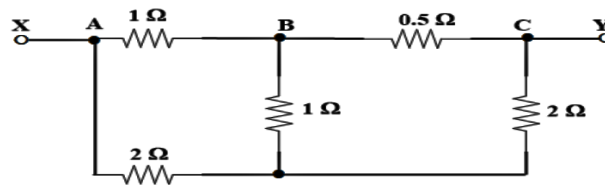


Figure 4

- (b) With the help of a power triangle explain the relation between active, reactive and apparent power for inductive as well as capacitive loads. Mention their units. [6M]

UNIT – IV

7. (a) Explain the operation of a full wave bridge rectifier with filter. [7M]
- (b) Draw and explain the v-I characteristics of a p-n junction diode. [7M]
8. (a) Draw the circuit diagram of a half wave rectifier. Explain the operation of the circuit with relevant waveforms. [7M]
- (b) Explain the operation of a zener diode as a voltage regulator with its connection diagram and characteristic curve. [7M]

UNIT – V

9. (a) Explain forward and reverse bias with respect to an npn transistor. [7M]
(b) With a neat circuit diagram explain the cc configuration of a transistor. [7M]
10. (a) Draw a neat circuit diagram of a single stage CE amplifier? Explain [7M]
(b) Explain how PNP transistor can be used as an amplifier. [7M]

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

ELECTRICAL CIRCUITS

[Common for : II Semester (ECE and EEE)]

Time: 3 Hours

Max Marks: 70

Answer 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) Derive the voltage, current and power relationship of the elements which stores magnetic field and the electric field. [6M]
- (b) A current wave $i(t)$ is applied to an inductance of 10H as shown in Figure 1 .Find $v(t)$. [8M]

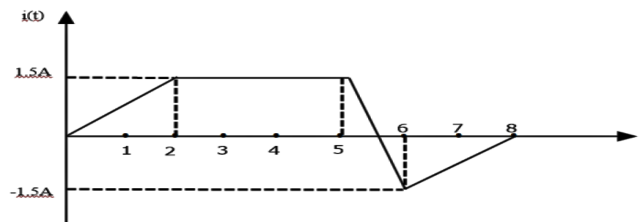


Figure 1

2. (a) A battery B_1 of emf 40V and internal resistance 2Ω is connected with another battery B_2 of emf 44V and internal resistance 2Ω . A load resistance of 6Ω is connected across the batteries. Calculate the current through each battery and the load. [7M]
- (b) Can practical voltage source be converted into practical current source and vice versa, if yes prove with necessary derivations and examples. [7M]

UNIT – II

3. (a) Find the node voltages for the circuit shown in Figure 2. [7M]

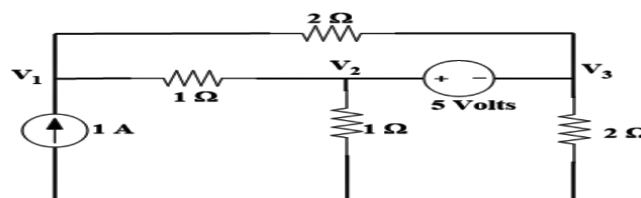


Figure 2

(b) Determine 'V 'in the circuit shown in Figure 3

[7M]

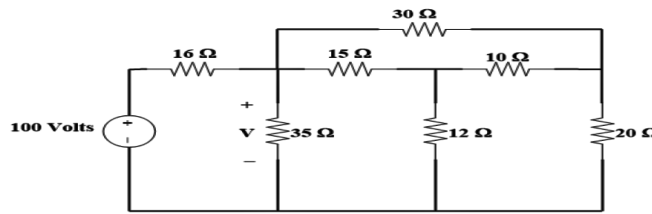


Figure 3

4. (a) Using any example explain a tree, link current, branch current and tie set schedule of the graph.

[7M]

(b) Explain cutest matrix. Obtain the cutest matrix for the graph given in Figure 4.

[7M]

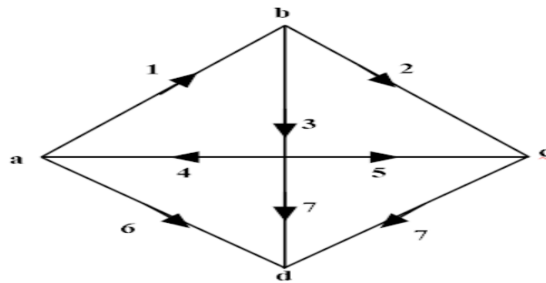


Figure 4

UNIT – III

5. (a) Derive the expression for RMS value and average value of sine wave their by Obtain form factor of sinusoidal ac wave form.

[7M]

(b) A resistance of 20 ohm and inductance of 0.02H and capacitance of $100\mu\text{F}$ are connected in series across 220V, 50Hz supply. Determine

[7M]

- i. impedance
- ii. current
- iii. voltage across R, L and C
- iv. power in Watts
- v. power factor

6. (a) A resistance of 24Ω , a capacitor of $150\mu\text{F}$ and an inductor of 0.16H are connected in series with each other. A supply of 240V, 50Hz is applied to the ends. Calculate

[7M]

- i. the current in the circuit
- ii. the potential difference across each element
- iii. the frequency to which the supply would need to be changed so that the current would be at unity power factor and
- iv. find the current at this frequency.

(b) Explain the relation between apparent power, active power and reactive power. Write their units. Also explain the significance of power factor.

[7M]

UNIT – IV

7. (a) State and Explain Faraday's laws of Electromagnetic Induction. Also define all nomenclature related to magnetic circuits [7M]
- (b) A series RLC circuit has $R=10\Omega$ and $L=60\text{mH}$. At a frequency of 25Hz the power factor of the circuit is 45° lead. At what frequency will the circuit be resonant? [7M]
8. (a) Two coils having 100 and 150 turns respectively are wound side by side on a closed iron circuit of cross section 125cm^2 and mean length 200cm . If the permeability of iron is 2000, calculate [7M]
- i. self-inductance of the coil
 - ii. mutual inductance between them
 - iii. the emf induced in the second coil if current in the first coil changes from 0 to 5 A in 0.02 seconds.
- (b) Compare the resonance in series and parallel RLC circuits. [7M]

UNIT – V

9. (a) Obtain Thevenin's equivalent circuit at A B as shown in Figure 5 [7M]

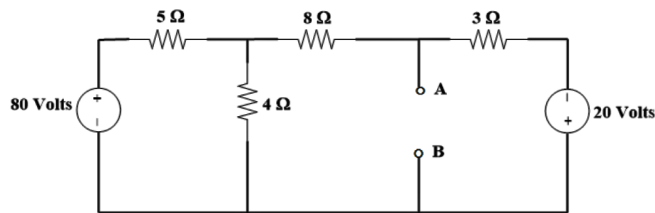


Figure 5

- (b) Calculate the value of R which will absorb maximum power from the circuit show in Figure 6. Also compute the value of maximum power. [7M]

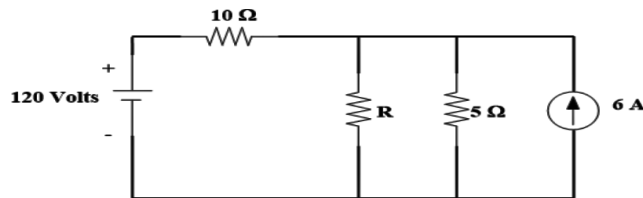


Figure 6

10. (a) State and explain superposition theorem. [7M]

(b) Calculate current I in the circuit given in Figure 7 using superposition theorem.

[7M]

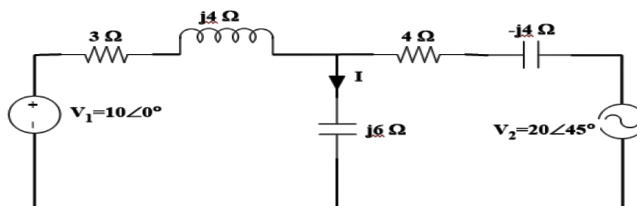


Figure 7

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

ENGINEERING MECHANICS

[Common for : II Semester (AE, ME and CE)]

Time: 3 Hours

Max Marks: 70

Answer 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 particle under a constant deceleration is moving in a straight line and covers a distance of 20 m in first 2 seconds and 40 m in the next 5 seconds. Calculate the distance it covers in the subsequent 3 seconds and the total distance covered, before it comes to rest. [7M]
- (b) On a straight road, a smuggler's car passes a police station with a uniform velocity of 10 m/s. After 10 seconds, a police party follows in pursuit in a jeep with a uniform acceleration of 1 m/s^2 . Find the time necessary for the jeep to catch up with smugglers car. [7M]
2. (a) Distinguish between the linear velocity of a point on a body rotating about a fixed axis and its angular velocity. Derive the relation between them. [7M]
- (b) An air-craft is moving at a speed of 150 kmph at an altitude of 750 m towards a target on the ground, release a bomb which hits the target. Estimate the horizontal distance of the air-craft from the target when it released the bomb. Calculate also the direction and velocity with which the bomb hits the target. [7M]

UNIT – II

3. (a) A lift carries a weight of 110 N and is moving with a uniform acceleration of 3 m/s^2 . [7M]
Determine the tension in the cables supporting the lift, when
 - i. lift is moving upwards, and
 - ii. lift is moving downwards. Take $g = 9.80 \text{ m/s}^2$.
- (b) Two blocks A and B are released from rest on a 30° incline, when they are 18m apart as shown in Figure 1. The Coefficient of friction under the upper block A is 0.2 and that under the lower block B is 0.4. In what time block 'A' reaches the block B? After they touch and move as a single unit, what will be the contact force between them? Weights of the block A and B are 100N and 80N respectively [7M]
4. (a) Two weights 800 N and 200 N are connected by a thread and move along a rough horizontal plane under the action of a force of 400 N applied to the first weight of 800 N. The coefficient of friction between the sliding surfaces of the weights and the plane is 0.3. Determine the acceleration of the weights and the tension in the thread using D'Alembert's principle. [7M]

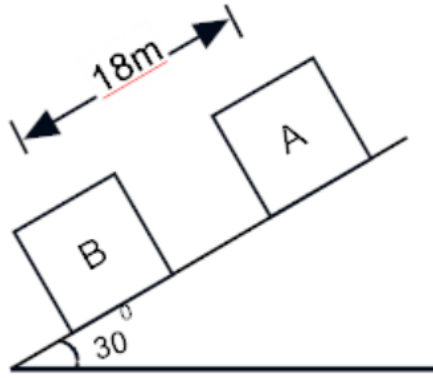


Figure 1

- (b) Two bodies of weights 40 N and 25 N are connected to the two ends of a light inextensible string, which passing over a smooth pulley. The weight 40 N is placed on a rough inclined plane while the weight 25 N is hanging free in air. If the angle of the inclined plane is 15° and the coefficient of friction between the weight 40 N and the rough inclined plane is 0.3, determine [7M]
- The acceleration of the system
 - The tension in the string

UNIT – III

5. (a) A ball of mass 20 kg moving with a velocity of 5 m/s strikes directly another ball of mass 10 kg moving in the opposite direction with a velocity of 10 m/s. If the coefficient of restitution is equal to $\frac{5}{6}$, then determine the velocity of each ball after impact. [7M]
- (b) A bullet of mass 50 gm is fired into a freely suspended target of mass 5 kg. On impact, the target moves with a velocity of 7 m/s along with the bullet in the direction of firing. Find the velocity of bullet. [7M]
6. (a) State the principle of virtual work and explain its applications. [7M]
- (b) A beam AB of span 10 m carries two point loads of 15 kN and 20 kN at 4 m and 6 m from the end A respectively. Determine the beam reactions by the principle of virtual work [7M]

UNIT – IV

7. (a) A car of mass 1000 kg descends a hill of 9.59° upward inclination. The frictional resistance to motion is 200 N. Using work energy method, calculate the average breaking effort to bring the car to rest from 48 km/h in 30 m. [7M]
- (b) A body weighing 20 N is projected up a 200 inclined plane with a velocity of 12 m/s, coefficient of friction is 0.15. Find [7M]
- the maximum distance the body will move up the inclined plane
 - the velocity of the body when it returns to its original position.
8. (a) Derive the expression for work energy equation of a body rotating about a fixed axis. [7M]
- (b) A hammer of mass 400 kg falls through height of 3 m on a pile of negligible mass. If it drives the pile 1 m into the ground, find the average resistance of the ground for penetration. [7M]

UNIT – V

9. (a) Explain the terms Simple harmonic motion, amplitude, frequency, oscillation and period of simple harmonic motion. [7M]
- (b) A body is moving with simple harmonic motion and has velocities of 8 m/s and 3 m/s at a distance of 1.5 m and 2.5 m respectively from the centre. Find the amplitude and time period of the body. [7M]
10. (a) Derive an expression for the time period of a simple pendulum of length 'l' performing simple harmonic motion. [7M]
- (b) A vertical shaft 5 mm in diameter and 1 m in length has its upper end fixed to the ceiling. At the lower end it carries a rotor of diameter 200 mm and weight 20 N. the modulus of rigidity for the material of the rotor is $0.85 \times 10^5 N/mm^2$. Calculate the frequency of torsional vibrations for the system. [7M]



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Question Paper Code: AME001



INSTITUTE OF AERONAUTICAL ENGINEERING
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B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

ENGINEERING DRAWING

[Common for : I Semester (AE, ME and CE)]

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- (a) Construct a diagonal scale to read metres, decimetres and centimetres for a R.F. of $1/50$ and long enough to measure up to 5 meters. Show on it a length of 2.89 metres, 3.67 metres and 4.44 metres. [7M]
(b) Draw the hyperbola when the distance of the focus from the directrix is equal to 50 mm and the eccentricity is $4/3$. Draw a tangent and normal at any point on the hyperbola. [7M]
- An elastic string of 150 mm long has its one end attached to the circumference of a circular disc of 50 mm diameter. Draw the curve traced out by the other end of the string, when it is completely wound around the disc, keeping the string always tight. [14M]

UNIT – II

- A line AB 60 mm long makes 45° and 30° angles with the V.P. and the H.P. respectively. Draw the projections and determine its traces when the end point A is 10 mm in front of V.P. and 20 mm above the H.P. [14M]
- Draw the projections of a rhombus having diagonals 125 mm and 50mm long, the smaller diagonal of which is parallel to both the principal planes, while the other is inclined at 30° to the HP. [14M]

UNIT – III

- A square pyramid, base 40 mm side and axis 90 mm long, has a triangular face on the ground and vertical plane containing the axis makes an angle of 45° with the VP. Draw its projections. [14M]
- Draw the top view and front view of a right circular cylinder, base diameter 40 mm and axis 65 mm long, when it is resting on its circular rim in such a way that its axis makes an angle of 30° with H.P. and the top view of its axis is inclined at an angle of 45° to V.P. [14M]

UNIT – IV

- A square prism of 50 mm edge and 65 mm height stands on one of its faces on the H.P. with a vertical face making 45° angle with V.P. A horizontal hole of 25 mm diameter is drilled centrally through the prism such that the hole passes through the opposite vertical edges of the cube. draw the development of the surface of the prism and the hole. [14M]

8. Draw the isometric view of a cone, base 40 mm diameter and axis 55 mm long [14M]
- when its axis is vertical and
 - when its axis is horizontal.

UNIT – V

9. Draw the following views of the object shown in Figure 1. [14M]
- Front view
 - Top view
 - Side view

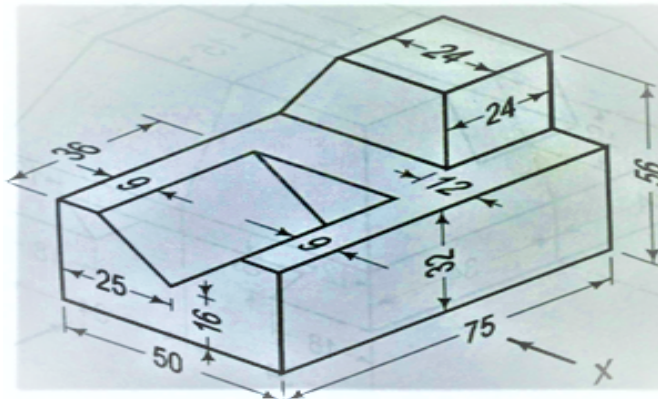


Figure 1

10. Draw the following views of the object shown in Figure 2. [14M]
- Front view
 - Top view
 - Side view

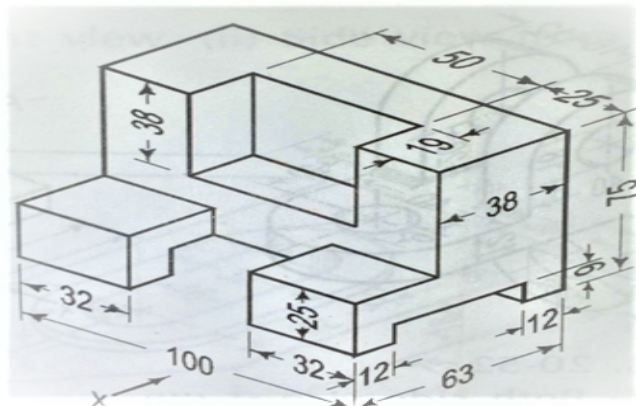


Figure 2

