2. (a) Solve the system of equations $Ax = b$, where

$$A = \begin{bmatrix} 2 & 1 & 1 & -2 \\ 4 & 0 & 2 & 1 \\ 3 & 2 & 2 & 0 \\ 1 & 3 & 2 & -1 \end{bmatrix}, \quad b = \begin{bmatrix} -10 \\ 8 \\ 7 \\ -5 \end{bmatrix}, \quad x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}$$

Using the Gauss-elimination method with partial pivoting.

(b) Compute singular value decomposition (SVD) of the matrix:

$$A = \begin{bmatrix} 4 \\ 0 \\ 3 & -5 \end{bmatrix}$$

(c) Find $A^{10}$, when $A = \begin{bmatrix} 2 & 2 \\ 2 & -1 \end{bmatrix}$ exactly.

(c') Transform the matrix

$$A = \begin{bmatrix} 1 & 2 & 4 \\ 2 & 1 & 2 \\ 4 & 2 & 1 \end{bmatrix}$$

to tridiagonal form by Given's method. Obtain the intervals of unit length, each containing one eigen value of $A$. Hence find the largest eigenvalue correct to two decimal places using Newton-Raphson method.
(b)  
(i) Find values of $a$ and $b$ such that the function:

$$f(x) = \begin{cases} 
ax^2 - x + 1, & 1 \leq x \leq 2 \\
3x - b, & 2 \leq x \leq 3 
\end{cases}$$

is a quadratic spline.

(ii) Obtain a cubic spline approximation valid in $[3, 4]$, for the function given in tabular form:

<table>
<thead>
<tr>
<th>$x$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>3</td>
<td>10</td>
<td>29</td>
<td>65</td>
</tr>
</tbody>
</table>

under the natural spline conditions $M(1) = 0 = M(4)$.

(c) Determine the piecewise quadratic fit $P(x)$ to $f(x) = \left(1 + x^2\right)^{\frac{1}{2}}$ with nodes at $-1, -\frac{1}{2}, 0, \frac{1}{2}, 1$.

OR

(c') Obtain a rational approximation of the form $R_{2, \infty}(x)$ to $\sin x$. Also find the order $[4+6+5]$ of its approximation.

3.  
(a) For the function $f(x) = 3 + e^x$ on the interval $[0, \pi]$, determine the $L_1$, $L_2$ and $L_\infty$ norms with respect to weight function $w(x) = x$.

(b) Obtain a least squares polynomial approximation of degree two for $f(x) = x^3$ on the interval $[0, 1]$ with $w(x) = 1$.

OR

(b') For the following data:

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>0.5</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>1</td>
<td>3.52</td>
<td>3.73</td>
<td>12.7</td>
</tr>
</tbody>
</table>

Compute the values of $a$, $b$ and the natural number $n$ such that the sum

$$\sum_{i=1}^{4} \left[ f(x_i) - a \sin(nx_i) - b \right]$$

is minimized.

(c) Determine as accurately as possible a straight line $y = ax + b$ approximating $1/x^2$ in the Chebyshev sense on $[1, 2]$. Calculate $a$ and $b$ to two correct decimals.
4. (a) A snack food manufacturer markets two kinds of mixed nuts, labelled A & B. Mixed nuts A contains 20% almonds, 10% cashew nuts, 15% walnuts and 55% peanuts. Mixed B contains 10% almonds, 20% cashew nuts 25% walnuts and 45% peanuts. A customer wants to use mixed nuts A and B to prepare a new mix that contains at least 4lb of almonds, 5lb cashew nuts, 6lb of walnuts, for a party. If mixed nuts A and B cost $2.50 and $3.00 per pound, respectively. Determine the amounts of mixed nuts A and B to be used to prepare the new mix at a minimum cost.

(b) Write the dual problem of the following LPP.

\[
\text{Minimize} \quad P = 15x_1 + 12x_2 \\
\text{Subject to} \quad x_1 + 2x_2 \geq 3 \\
\quad \quad \quad \quad \quad 2x_1 - 4x_2 \leq 5 \\
\quad \quad \quad \quad \quad x_1, x_2 \geq 0.
\]

(c) Use simplex method to solve the LPP:

\[
\text{Minimize} \quad P = 4x_1 + x_2 \\
\text{Subject to} \quad 3x_1 + x_2 = 3 \\
\quad \quad \quad \quad \quad 4x_1 + 3x_2 \geq 6 \\
\quad \quad \quad \quad \quad x_1 + 2x_2 \leq 4 \\
\quad \quad \quad \quad \quad x_1, x_2 \geq 0.
\]
Maximum Marks : 60

Note : Answer ALL questions. The symbols have their usual meaning.

1. (a) What do you mean by static dielectric constant and distinguish between the solids according to dielectric behavior?

(b) Define internal field in dielectrics and show that \( E_{\text{internal}} = E + \frac{P}{3\varepsilon_0} \), where \( E \) is the applied field and \( P \) is the dipole moment per unit volume.

OR

(b') Define orientational polarization (\( P_0 \)) and show that \( P_0 = N\mu_0^2 E/3kT \) for polyatomic gases.

(c) What is ferroelectricity? Give three examples of ferroelectric materials.

(d) The electronic polarizability of the Ar atom is \( 1.7 \times 10^{-40} \) \( \text{F m}^2 \). What is the static dielectric constant of solid Ar (an FCC crystal below 84 K) if its density is 1.8 \( \text{g/cm}^3 \)? Given

\[ N_a = 6.02 \times 10^{23} \text{ mol}^{-1} \text{ and Relative atomic mass of Ar} = 39.95 \text{ g/mol} \]

2. (a) Explain the frequency dependence of electronic polarizability in detail. Plot the real and imaginary parts of the polarizability with frequency of an atom.

(b) Define loss-tangent. Show that absorption of energy per m³ is given by \( W(t) = (\alpha/2) \varepsilon_0 \varepsilon_r^2 E_0^2 \).

(c) Establish the Einstein relation \( D/\mu = kT/q \).

OR

(c') Boron is implanted into an n-type Si sample \( (N_a=10^{16} \text{ cm}^{-3}) \), forming an abrupt junction of square cross section, with area=2x10³ \( \text{cm}^2 \). Assume that the accepter concentration in the p-type region is \( N_d = 4 \times 10^{18} \text{ cm}^{-3} \). Calculate \( V_o \) and \( \varepsilon_r \) for this junction at equilibrium (300K). Given \( \varepsilon_r = 11.8 \), \( n_i = 1.5 \times 10^{16} \text{ cm}^3 \text{and } k = 8.617 \times 10^{-5} \text{ eV/K} \).

3. (a) Draw and explain B/H curve of a ferromagnetic system. Define spontaneous magnetization.

(b) A paramagnetic system is subjected to a homogeneous field of \( 10^6 \) \( \text{A/m} \) at a temperature of 300K. Find the average dipole moment along the field direction per atom in Bohr magneton.

(c) Discuss antiferromagnetism. Establish a relation between Neel temperature and paramagnetic Curie temperature. What are your comments on this relation?

OR

(c') Write a note on ferrites.

4. (a) Differentiate between a perfect conductor and a superconductor. Give following graphical representations along with their mathematical relations

\[ \lambda_4 \text{ vs } T, \text{ n}_4 \text{ vs } T \text{ and } H_4 \text{ vs } T \]

(b) What is Josephson effect? Show that the current flowing across the Josephson junction is given by \( I = I_0 \sin \delta \) under no biasing.

(c) List five high temperature superconductors.

*****
2012 – 2013
B. TECH. AUTUMN (V SEMESTER) EXAMINATION
(Electrical/Mechanical/Electronics/Computer/Civil/Chemical,
(Power Electronics & Applications)
EE-301(Open Elective)

Maximum Marks: 60
Credits:04
Duration: Three Hours

Instruction to the Examinees:
Answer all the questions. Notations used have their usual meaning.
Assume suitable value for any missing data.
Use graph paper or waveform exercise sheets to show waveforms.

Discuss

Q.1 (a) Give the differences between the following with the help of static V-I
Characteristics:
(i) TRIAC & IGBT (ii) DIODE & SCR

(b) Describe reverse recovery characteristics of a power diode. Show that reverse
recovery time and peak inverse current are dependent upon storage charge
and rate of change of current.

OR

Q.1' (a) Discuss in details:
(i) $\frac{di}{dt}$ limitations & (ii) $\frac{dv}{dt}$ limitations.
of a Thyristor.

(b) Discuss the classifications of Power Elelectronics Converters. Also mention
their important applications.

Q.2 (a) What are the necessary conditions for turning-on of an SCR with a gate
signal? Discuss.

(b) Explain the merits and demerits of self commutation of SCR and its other
method of commutation.

Q.3 (a) Draw and explain the wave shapes of supply voltage, output voltage, load
current, current through SCR, current through freewheeling diode and
voltage drop across SCR of a single phase semi-converter controlled rectifier
feeding an RLE load for a switching angle, $\alpha = 60^\circ$.

(b) What is the principle of ac phase control, explain?

OR

Q.3' (a) Define the following terms:
(i) Ripple Factor (ii) Form Factor (iii) THD (iv) Displacement Factor
(v) Efficiency of Rectification & (vi) Transformer Utilization Factor as
applicable to rectifier circuits.
Q.4 (a) With the help of waveforms, explain both Continuous and Discontinuous conduction mode of STEP-UP (BOOST) Converter. Also mention their important applications.
(b) For type-A Chopper, dc source voltage is 230V. Load resistance is 10Ω. Take a voltage drop of 2 V across chopper when it is on. For a duty cycle of 0.4, calculate average and rms value of output voltage and chopper efficiency.

Q.5 (a) Describe the working of a single-phase half-bridge inverter. What is its main drawback? Explain how this drawback is overcome.
(b) Enumerate industrial applications of:
(i) Cycloconverters and (ii) Inverters (both CSI & VSI)

OR

(b') A single phase CSI is fed from 220 V dc source. The load is 10 Ω. Thyristors have turn-off time of 20 µs and inverter output frequency is 50Hz. Take the factor of safety of 2. Determine suitable value of source inductance assuming a maximum current change in one cycle. Also find the value of commutating capacitor.
2012 – 2013
B.TECH. AUTUMN (V SEMESTER) EXAMINATION
(OPEN ELECTIVE)
(Civil / Architecture / Electrical / Electronics / Computer / Chemical / Petro-Chemical and Mechanical Engineering)
Pumps, blowers and compressors
(ME – 437)
Credits: 04

Maximum Marks : 60
Duration : Three Hours

Note: (i) Assume any missing data if not given.
(ii) Draw diagrams where needed.

1. (a) Define slip. When slip will be negative?

(b) A single acting reciprocating pump has a diameter of 30 cm and stroke 50 cm. It takes the supply of water from a sump 3.5 m below the pump axis through a pipe 10 m long 20 cm dia. If separation occurs at 2.5 m of water abs, Determine (i) speed at which separation may take place (ii) change in speed of pump if an air vessel is fitted on the suction side 2.5 m above the sump water level. Take $\lambda = 4f = 0.04$, Barometric head = 10.3 m of water.

OR

1'. A single acting reciprocating pump has a stroke length of 15 cm the suction pipe is 7m long and the ratio of suction pipe diameter to the plunger diameter is $\frac{3}{4}$. The water level in the sump is 2.5m below the axis of the pump cylinder and the pipe connecting the sump and pump cylinder is 7.5 cm diameter. If the crank is running 75 rpm, determine the pressure head on the piston at the beginning, mid and end of the suction stroke. Take friction factor $\lambda = 4f = 0.04$.

2. (a) Evolve head discharge curve of a centrifugal pump impeller and show that backward curved impeller is used in centrifugal pump generally.

(b) A centrifugal pump has an impeller of 18 cm outer diameter and when running at 1440 rpm, discharges water 10 m$^3$/min against a net head of 9m. The inner diameter of impeller is 9 cm, the blades are set back at outlet at $45^\circ$, area of flow is constant as 0.06 m$^2$. Find manometric efficiency and blade angle at inlet.

OR

(b') A centrifugal pump has a delivery lift of 13m and suction lift of 2m. The velocity in the delivery pipe is 1.5 m/sec. The velocity of flow through the impeller is 3 m/sec and impeller blade angle at exit is $30^\circ$. Neglect losses. Find

Contd.....2
3. (a) What is hydraulic similitude? Why model testing is necessary before manufacturing. Give two reasons.

(b) A hydraulic turbine is to develop 845 KW when running at 100 rpm under a net head of 10m. Work out the flow rate and specific speed for the turbine if the overall efficiency for best operating point is 92%. In order to predict the performance, a 1:10 scale model is tested under a head of 10m. What would be the speed, power output and water consumption of the model if it runs under the condition similar to the prototype.

4. (a) Derive the Euler's head for centrifugal blower.

OR

(a') Define total and stagnation temperature and derive

\[ T_{0t} = T_1 + \frac{V_1^2}{2C_p} \]

(b) Air at a pressure of 10.1325 N/m² and a temperature of 288K is compressed in a single stage turbo blower to 13.8 \times 10^4 N/m². Calculate the work done per kg of air if the compression follows the law \( pV^{1.6} = \text{const.} \). Take \( C_p = 1200 \) J/KgK. If the volume of free air compressed / min by the blower is 1020 m³, determine power required to derive the blower and the adiabatic efficiency.

5. (a) What do you mean by surging choking and stalling? Explain briefly.

(b) An axial flow compressor having eight stages and 50 reaction design compresses air in the pressure ratio of 4:1. The air enters the compressor at 20°C and flows through it with a constant speed of 90 m/sec. The rotating blades of compressor rotate with 180 m/sec. Isentropic efficiency of the compressor may be taken as 82%. Calculate

(i) Work done by the m/c.

(ii) Blade angles.
Maximum Marks : 60

Note: Answer all questions.

1. (a) What is atmosphere? Give the composition of atmosphere. 
   (b) Discuss the energy balance in the atmosphere. 

2. (a) What is photochemical smog? Explain NO – NO₂ – O₃ photochemical reaction sequence with the help of diagram. 
   (b) Write short notes on any TWO of the following:
      (i) Methanol as alternative fuel. 
      (ii) Nitrogen Cycle. 
      (iii) Absorption of electromagnetic radiation by molecule. 

3. (a) What are criteria pollutants? Discuss the sources and physiological effects of carbon monoxide. 
   (b) What is the significance of PM₁₀ and PM₂.₅? Explain how human respiratory system defends itself against the invasion of particulates. 

4. (a) Name the various methods used to control air pollutants. What is diffusion method? 
   (b) Describe the working of electrostatic precipitator. 

5. (a) Name various methods for sampling gaseous pollutants. Discuss the principle and significance of condensation process. 
   (b) Write notes on any TWO of the following:
      (i) Ethylene blue method for the determination of H₂S. 
      (ii) Hapcolite monitor of CO. 
      (iii) Acid titration method for SO₂. 

6. (a) Describe green house effect. 
   (b) Write the catalytic reaction for the destruction of stratospheric ozone with chlorine and Bromine. 
   (c) Draw a labelled diagram of Action spectra for damage to plants, DWA and human skin. 
   (d) What are the sources of methyl bromide (CH₃Br) in catalytic destruction of stratospheric ozone?
Maximum Marks : 60

Duration : Three Hours

Note: Answer all questions. Each question carry equal marks.

1. It is desired to develop steady state mass fraction on tray for a eight plate absorption column. It can be assumed that a linear equilibrium relation holds between liquid mass fraction $x_m$ and vapour mass fraction $y_m$ leaving on each plate:

$$y_m = a x_m + b$$

The mass flow rate and mass fraction of the inlet stream is known. Explain the solution strategy on MS-Excel for determination of tray composition.

OR

1'. A tank contain 20m$^3$ of water. A stream of salt solution with composition 2 Kg-salt/m$^3$ of solution is fed into the tank at a rate of 8.33x10$^{-3}$ m$^3$/s. Liquid flows from the tank at a rate of 5.56x10$^{-4}$ m$^3$/s. If the tank is well agitated what is the concentration of the salt in the tank when the amount of solution in it is 30m$^3$.

2. For fluid flow in pipe friction is described by a dimensionless number, the fanning friction factor $f$. The fanning friction factor is dependent of many parameter related to size of the pipe and the properties of the fluid which can all be represented by another dimensionless quantity the Reynolds number $Re$. A formula that predicts $f$ for a given $Re$ is the von Karman equation.

$$\frac{1}{\sqrt{f}} = 4 \log_{10} \left(Re\sqrt{f}\right) - 0.4$$

typical values for the Reynolds number for turbulent flow are 10000 to 500000 and for a fanning friction factor are 0.001 to 0.01. Develop solution strategy to calculate $f$ at given $Re$ on MS-Excel.

OR

Contd......2
For finding the roots of the following equations
\[ x^2 - yx = 3 \]
\[ x + y^2 = 13 \]
with the initial guess \( y - x \), elaborate the solution strategy on the command prompt of the MATLAB using the following functions.
'inlin', 'eval' and 'fzero'

3. The permeability of air through a thin soap film varies with temperature as
\[ k_p = \alpha \sqrt{T} e^{-\frac{E}{RT}} \]
where \( k_p \) is the permeability (m/s), \( \alpha \) is a constant (m s\(^{-1}\) K\(^{-0.5}\)), \( T \) is absolute temperature in K, \( E \) is activation energy for hole formation (J mol\(^{-1}\)), and \( R \) is universal gas constant (8.314 J mol\(^{-1}\) K\(^{-1}\)). How \( E \) and \( \alpha \) can be determined using following command of the MATLAB
'polyfit', 'regress', and '\`

<table>
<thead>
<tr>
<th>( k_p ) (m s(^{-1}))</th>
<th>1 \times 10^{-2}</th>
<th>1.5 \times 10^{-3}</th>
<th>2.15 \times 10^{-3}</th>
</tr>
</thead>
<tbody>
<tr>
<td>( T ) (K)</td>
<td>294</td>
<td>303</td>
<td>313</td>
</tr>
</tbody>
</table>

4. Consider the following set of equations to be solved
\[ x_1x_3 + \frac{x_5^2}{x_5} - 4 = 0.0 \]
\[ x_2x_5 - 3x_6 = 0.0 \]
\[ \frac{x_1}{x_2} + 1 \ln \left( \frac{x_3}{x_4} \right) - 2 = 0.0 \]
\[ x_3^2 + 2x_7 - 6 = 0.0 \]
\[ x_2 + x_6 = 0.0 \]
\[ x_3(x_3 + x_4) - 7 = 0.0 \]

Precedence order these equation using the SWS algorithm along with Steward and Rudd algorithm.
2012-2013
B.TECH/ B. ARCH. AUTUMN (VII SEMESTER) EXAMINATION
ARCHITECTURE/ CHEMICAL/ CIVIL/ COMPUTER/ ELECTRICAL/
ELECTRONICS/ MECHANICAL/ PETROCHEMICAL ENGINEERING
SELECTED TOPICS IN COMPUTER ENGINEERING-1
CO-446N
Credits: 04
(OPEN ELECTIVE)

Maximum Marks: 60
Duration: Three Hours

- Attempt all questions. All question carry equal marks.
- Attempt two parts from a question.

1. 
   a) Differentiate between cryptography and steganography. What is the difference between symmetric-key encryption and asymmetric-key encryption.

   b) What are passive and active attacks? Categorize passive and active attacks in a tabular format.

2. 
   a) What do you understand by Page Replacement Algorithms?

   b) Explain swapping and paging in detail with respect to operating systems.

   (OR)

   b) What is segmentation in operating systems? Explain with the help of suitable diagrams.

3. 
   a) List the different type of 1G/2G/3G cellular networks. Explain D-AMPS cellular architecture in detail. What frequency does D-AMPS use? What is the reuse factor for D-AMPS networks?

   b) How does a wi-fi network differ from a cellular network? What is the range of both these networks? Give the different types of wi-fi and cellular networks presently in use.

   (OR)

   b) Write a note on cellular internet access. Explain with the help of suitable diagrams. What is CDPD, SGSN and GGSN?

4. 
   a) What do you understand by Ubiquitous Computing? Explain with the help of suitable examples.
b) Draw the diagram of a Pervasive Web Application Architecture and explain in detail.

(OR)

b) What are the different devices used in pervasive computing? How did the 2G/3G cellular technologies aid in the development of pervasive computing?
2012 – 2013
B. Tech. Autumn Semester Examination
(Elect./Mech./Civil/Arch./Chem./Electronics/Comp./Petro-chem. Engineering)
Open Elective
ARTIFICIAL INTELLIGENCE & NEURAL NETWORKS
EL – 432N
Credits: 04

Max. Marks: 60
Duration: 3 Hours

Note: Attempt ALL questions. Make suitable assumptions, if required.

Q. 1 (a) Explain the properties of task environments that are used to characterise them. 8
Q. 1 (b) What are the different approaches to AI? Comment on the modern approach. 7

OR

Q. 1' (a) Give two important criteria for deciding the Performance measure of a rational agent and their implications for a human agent. 5
Q. 1' (b) Explain the working of Simple Reflex agents. 5
Q. 1' (c) Explain, with examples, the difference between static, dynamic and semi-dynamic environments. 5

Q. 2 (a) Solve the 8-queens problem using an incremental formulation with a suitable search algorithm. 7
Q. 2 (b) Consider a state space where the start state is number 1 and the successor function for state n returns two states, numbers 2n and 2n+1. Suppose the goal state is 19. List the order in which nodes will be visited for breadth-first search, depth-limited search with limit 4, bidirectional search and iterative deepening search. Compare the performance of all these techniques in a tabular form. 8

OR

Q. 2' (a) Suggest a heuristic cost function for the 8-puzzle problem. Apply Hill-climbing search to reach the goal state which can be described as [ _ 1 2; 3 4 5; 6 7 8], starting from an initial state given by [1 4 2; 5 _ 8; 3 6 7]. If two neighbours have same cost, then try both paths if one gets stuck at a local minimum. 7
Q. 2' (b) You have three jugs, measuring 12, 8, and 3 litres, and a water faucet. You can fill the jugs up or empty them out from one to another or onto the ground. You need to measure out exactly one litre. Formulate the problem and solve it using an appropriate search technique. 8

Q. 3 (a) Give the rules of inference used in Propositional logic. 7
Q. 3 (b) Represent the following sentences in Predicate logic. Also logically infer the answer to the question: Was Marcus Brutus loyal to Caesar? Introduce any commonly known fact if it is essential to make the inference. 8

1. Brutus was a man.
2. Brutus was a Roman.
3. Caesar was appointed by the senate as dictator in perpetuity.
4. All Romans were either loyal to Caesar or hated him.
5. Everyone is loyal to someone.
6. People only assassinate rulers they are not loyal to.
7. Brutus assassinated Caesar.
Q. 4 (a) Design a binary classifier, if the binary input vectors \([000], [010], [100]\) and \([101]\) lie in Class A and remaining are in Class B.

Q. 4 (b) What is Cover's theorem? Apply it to implement the XOR function with less than three neurons.

Q. 4 (c) Implement the logic function of 3 inputs given by \(Y(x_0, x_2, x_3) = \Sigma(0, 2, 3, 6)\), using minimum number of neurons.
Answer all questions.

1. Answer any two of the following:
   (a) Describe the role of atmosphere in relation to Earth, Sun and Pollution effects.
   (b) Describe the Plume behaviour as a function of atmospheric stability displaying the diurnal effect on a continuously emitting point source.
   (c) Describe the Pollution cycle and the various exchanges and interactions between Air-Water-Land.
   (d) Describe the PINDEX scheme for assessing Air Pollution severity. (6+6)

2. What do you understand by 'Photochemical Smog'. Describe the nature of photochemical smog and its effects. (12)

OR

2. Describe the mechanism of formation of Carbon monoxide, Sulphur oxides and Organic pollutants.

3. Describe various types of sampling probes. Explain the stack sampling technique to collect the accurate and representative sample. How would you select the traverse points in circular and rectangular stacks. (12)

OR

3. Discuss the Gas Filter Correlation (GFC) technique for CO measurement. What advantages this technique has over conventional NDIR analyzer? (12)

4. (a) Name the techniques commonly employed to remove particulates from polluted gas streams. Describe Gravity settling chambers and Cyclone separator in detail. (6)
   (b) Methane is to be destroyed in a Flare. The flow rate is 0.25 m³/s at 3 bar and 25 °C. Assuming that the personnel will not be exposed to flare for periods exceeding 20 minutes, find the height of the flare above the ground if its diameter is 0.2 m. Take the lower calorific value of methane as 50 MJ/kg. (6)

5. Write short notes on the following
   (i) Sources of Evaporative Emissions in Petrol Engines
   (ii) Exhaust Emissions from Diesel Engines (6+6)
1(a) What is the difference among Homopolymer, Copolymers and polymer blends? Explain types of copolymers with suitable examples.

Or

(a') Classify the polymers on the basis of (a) Origin, (b) End use, (c) Stereo regularity.

(b) Write the name of polymer, monomer and structure of the following: (a) HDPE, (b) PP, (c) PS, (d) SAN, (e) PA

(c) You are supposed to select a polymeric material for one of the following industrial applications. Explain the properties critical for the application, select the one most suitable polymer and compare it with at least one nearest rival polymeric material on the basis of performance and economics.

(i). Molded Furniture
(ii). Cabinet of Induction Cooktop
(iii). Radiator of a Car

2(a). What do you mean by mechanical properties of polymers? Explain the following terms.

(a) Creep, (b) Fatigue, (c) Resilience, (d) Compliance

(b) The stress-strain curve for Polystyrene (PS) and High impact Polystyrene (HIPS) is given below. Explain the differences in mechanical properties of PS and HIPS on the basis of SSS.
(b'). The stress-strain curve of few commercial polymers is given below. You are supposed to select the most appropriate material for Fishing Net. Justify your selection and rejection on the basis of stress-strain curve of materials.

(c). Calculate the relaxation time for a given Maxwell model. Also calculate the residual stresses in material after 25 seconds of loading. Initial stress developed due to constant strain loading is 150MPa. 

\[(E = 15 \text{ GPa}; \eta = 60 \text{ GPa})\]

(c'). What do you mean by dynamic loading? How energy dissipation is dependent on frequency of loading? Explain with the help of DMA curve.

3(a). What do you mean by thermal properties of polymers? Explain the various transitions in DSC scan marked as 1, 2 & 3.

(a'). Explain the structural factors affecting the glass transition of polymers.

(b). Explain the construction and working of Differential Scanning Calorimeter (DSC). Explain how you will relate the DSC curve with glass transition.
(c). How Thermo-gravimetric Analyzer (TGA) characterize the thermal stability of polymer?

4(a). What do you mean by polarization? Explain the types of polarization in a dielectric (polymer). Explain the type of polarization a non-polar polymer will undergo and why?

Or

(a'). Explain the dependency of dielectric constant (ε) on internal viscosity of polymer, temperature, frequency and presence of dipole in polymer structure.

(b). What will happen to a dielectric (polymer) subjected to a varying electrical field? Differentiate between dielectric dissipation factor (tanδ) and dielectric loss factor (ε'').

(c). What do you mean by chemical properties of polymer? Explain the Hansen solubility map and its application in formulation of polymer composition.
2012-2013
B. TECH. AUTUMN (VII SEMESTER) EXAMINATION
(ELECTRICAL/MECHANICAL/ELECTRONICS/COMPUTER/CIVIL/
CHEMICAL/ PETRO-CHEMICAL/ARCHITECTURE ENGINEERING)
(OPEN ELECTIVE)
DISASTER MANAGEMENT
(CE – 444N)

MAXIMUM MARKS: 60
Credits: 04
Duration: Three Hours

Note: Answer all questions. Assume suitable data if required

1. Describe the effects of different type of radiation particles generated due to Nuclear Disaster

2. a. Classify damages caused by cyclones to foundations and walls made of cement concrete block according to Indian standard procedure.

2. b. What are the main features of tropical cyclone?

2. c. What is the damage potential of a super cyclonic storm and suggest action to be taken.

OR

2.a'. A site is surrounded by two line faults at a distance of 14.8m and 21.6m respectively. The first source has a potential of M=8 earthquake and second for M=6.7. Determine the expected mean value of PGA at the site using Cornell's attenuation law.

2.b'. The 1906 San Francisco earthquake had a magnitude of about 8.3. The 1989 Loma Prieta earthquake that struck San Francisco had a magnitude of 7.1. How much greater was the shaking in 1906 earthquake compared with the shaking in 1989?

2.c'. List retrofitting performance objectives of a building.

(10)

(6+7+7)

(6+6+8)
3. Enumerate different kinds of landslides. What measures are taken to counter and minimize the effects of landslides? (10)

OR

3'. Give a short account of hazards related to volcanism. What are the probable regions to be affected by this hazard in terms of plate tectonic setup. List measures taken at preparedness and mitigation levels. (10)

4. a. Estimate the maximum flood flow for the following catchments by using an appropriate empirical formula. (5)

   a) A1 = 56 km² for Western Ghats area, Maharashtra.
   b) A2 = 56 km² in Gangetic Plain.
   c) A3 = 56 km² in Cauvery Delta, Tamil Nadu.
   d) What is the peak discharge for Area = 56 km², by maximum flood experience?

4. b. What are the factors causing floods, discuss mitigation and preparedness strategies for minimizing its effects? (5)

5. Discuss the disaster management system in place and its role in disaster mitigation initiatives with special reference to India. (10)