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<td>(ii) Biodiesel</td>
<td></td>
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<td></td>
<td>(iii) CNG</td>
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<td>What is the importance of indoor air quality? Describe the factors affecting the indoor air quality.</td>
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(iii) Atomic Absorption Spectrometry

4 (a) What is the principle of wet collectors? Explain cyclone scrubber method in air pollution control. [6]

4 (b) Discuss any two of the followings in brief: [4]

(i) Fabric filters
(ii) Venture scrubber
(iii) Electrostatic precipitator

5 What are natural cycles? Explain the carbon and nitrogen cycles in detail. [10]

6 (a) What is the significance of Green House effect? Describe the various regional impacts of global warming. [6]

6 (b) Discuss the formation and depletion of ozone. [4]
Max Marks: 60

Note: Answer all questions. Programmable calculators are not allowed. Write answers up to four decimals.

1. (a) Using Crout’s method, solve the following system of equations:
   \[4x + y + z = 4; \quad x + 4y - 2z = 4; \quad 3x + 2y - 4z = 6.\]
   (b) Compute singular value decomposition (SVD) of the matrix \(A = \begin{bmatrix} 4 & 0 \\ 3 & -5 \end{bmatrix}\).
   (c) Using Given’s method, transform the following matrix
   \[A = \begin{bmatrix} 1 & \sqrt{2} & \sqrt{2} & 2 \\ \sqrt{2} & -\sqrt{2} & -1 & \sqrt{2} \\ \sqrt{2} & -1 & \sqrt{2} & \sqrt{2} \\ 2 & \sqrt{2} & \sqrt{2} & 3 \end{bmatrix}\]
to tridiagonal form.

OR

(c') Define Gershgorin’s circles and bounds for a \(n \times n\) matrix and hence estimate the eigen values of the matrix,
   \[A = \begin{bmatrix} 1 & 2 & -1 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}\]
   Also draw the diagram to explain bounds.

2. (a) If linear interpolation is used to interpolate the error function
   \[f(x) = \frac{2}{\sqrt{\pi}} \int_0^x e^{-t^2} dt,\]
   show that the error of linear interpolation using the data \((x_0, f_0), (x_1, f_1)\) cannot exceed \((x_1 - x_0)^2 / 2\sqrt{2\pi}\).

OR

(a') Obtain the formula to determine step size \(h\) that can be used in the tabulation of a function \(f(x)\), \(a \leq x \leq b\) at equally spaced nodal points so that the truncation error of the quadratic interpolation is less than \(\varepsilon\). Hence find \(h\) if \(f(x) = x^2 \ell_n x,\)
   \([a, b] = [5, 10] \& \varepsilon = 5 \times 10^{-6}\).
(b) (i) Find the values of $\alpha$ and $\beta$ such that the function

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

is a quadratic spline.

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

(c) Obtain a rational approximation of the form $R_{2,2}(x)$ to $e^x$. Also find the order of its approximation.

3. (a) For the function $f(x) = 1 + \frac{\sin 8\pi x}{2}$ on the interval $[0,1]$, determine $L_1$, $L_2$ and $L_\infty$ norms with respect to weight function $w(x) = 1$.

(b) Obtain the least squares polynomial approximation of degree two for $f(x) = \frac{1}{1 + x^2}$ in the range $-1 \leq x \leq 1$.

OR

(b') Experiments with a periodic process gave the following data:

<table>
<thead>
<tr>
<th>$t^2$</th>
<th>0</th>
<th>50</th>
<th>100</th>
<th>150</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>350</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>0.754</td>
<td>1.762</td>
<td>2.041</td>
<td>1.412</td>
<td>0.303</td>
<td>-0.484</td>
<td>-0.380</td>
<td>0.520</td>
</tr>
</tbody>
</table>

estimate the parameters $a$ and $b$ in the model $y = b + a \sin t$, using the least squares approximation.

(c) Determine the polynomial of second degree, which is the best approximation in minimax norm to $\sqrt{x}$ on the set of points $\left\{0, \frac{4}{9}, 1\right\}$.

4. (a) Solve the following LPP (graphically):

Minimize $P = 2x + 3y$

Subject to $x + y \geq 4$; $6x + 2y \geq 8$; $x + 5y \geq 4$

$x \leq 3$; $y \leq 3$; $x, y \geq 0$.

(b) Use simplex method, to solve the following LPP:

Maximize $P = 12x + 6y + 4z$

Subject to $4x + 2y + z \leq 60$; $2x + 3y + 3z \leq 50$;

$x + 3y + z \leq 45$; $x, y, z \geq 0$
Answer all the questions. 
Assume suitable data if missing. 
Notations used have their usual meaning.

1(a) Differentiate amongst the following with suitable example. 
- \(\text{asin and asind} \)
- \(\ast\) and \(\ast\ast\)
- \(\text{size and length} \)
- \(\text{ones and zeros} \)
- \(\text{who and whos} \)

OR

1(a') With the help of linspace write the command to be entered on command prompt to generate matrix of 5x5 elements on command window. Now elaborate the instruction needed on the command prompt that shall transform the developed matrix into another one having diagonal elements zero while retaining other elements. With the help of rot90 command can you produce the transpose of above matrix? Explain.

1(b) Create the database for three student using cell array storing information about student code, name, subjects and CPI. Elaborate the commands how to access the information about the subject of the student.

2 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 (ms\(^{-1}\)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/functions of the MATLAB
‘regress’, ‘fit’ and ‘

<table>
<thead>
<tr>
<th>( k_0 ) (m s(^{-1}))</th>
<th>1(\times)10(^{-3})</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>

OR

2'(a) Elaborate the methods and command needed to solve the following system of nonlinear equation on MATLAB.
\[
f_1(x(1),x(2)) = 2x(1) - x(1) - x(2) - \exp(-x(1))
\]
\[
f_2(x(1),x(2)) = -x(1) + 2x(2) - \exp(-x(2))
\]

2'(b) Explain the following with suitable example:
diff, quad, integral, integral2, dblquad

3(a) Elaborate the steps to solve the following set of simultaneous differential equation on MATLAB.
\[
\frac{dx_1}{dt} = -\frac{1}{2} x_2 + \frac{x_1 x_2}{20}, \quad \frac{dx_2}{dt} = x_1 + \frac{x_1 x_2}{10}
\]
With \( x_2(0) = 5 \), \( x_1(0) = 10 \)

OR

3(a') Let the transfer functions of the two systems be given by:
\[
G_1(s) = \frac{10}{(s+1)(s+2)} \quad \text{and} \quad G_2(s) = \frac{2}{(s^2 + 4)}
\]
write the command to determine the overall transfer function for series, parallel and feedback arrangement. What the commands are required to get plot under unit step response for these arrangements?

3(b) Elaborate the different files needed to solve the partial differential equation through MATLAB.

4 Write step by step procedure to develop Simulink model described by the following dynamic equations to get the response for the unit step.
\[
\begin{align*}
x_1' &= x_2 \\
x_2' &= x_3 \\
x_3' &= -4x_1 - 2x_2 - 3x_3 + u(t)
\end{align*}
\]
And \( y = [1 \ 0 \ 0] x \) Assume initial conditions to be zero. Use state space model from the Simulink library.
2015-16  
B.TECH. (AUTUMN SEMESTER) EXAMINATION  
BRANCH: MECHANICAL/  
CIVIL/ CHEMICAL/ ELECTRONICS/ COMPUTERS/ ARCHITECTURE  
RENEWABLE ENERGY SOURCES  
COURSE CODE: EE-421/ EE-472

Maximum Marks: 60  
Credits: 04  
Duration: Three Hours

Answer all the questions.  
Assume suitable data if missing.  
Notations used have their usual meaning.

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<td>Evaluate the benefits of energy conservation due to increased energy demand</td>
<td>[06]</td>
</tr>
<tr>
<td>1(b)</td>
<td>Classify different energy storage systems? What are the main advantages and limitations of a battery storage system?</td>
<td>[06]</td>
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OR

| 1'?(a) | What do you understand by energy conservation, explain? | [06] |
| 1'(b)  | What do you understand by cogeneration? With the help of a block diagram, explain co-generation of a power plant. | [06] |
| 2(a)   | What is the need of MPPT in a solar photovoltaic (SPV) system, explain? | [06] |
| 2(b)   | A 2 MW SPV power plant being set up in our university to make it a green university. Estimate (approximately): (a) average energy generation per day, (b) energy generated per year, and (c) tariff saved per year, at a rate of Rs. 6 per unit. | [06] |
| 3(a)   | Discuss VI characteristics of a fuel cell and describe various types of polarizations. | [06] |
| 3(b)   | Draw a neat diagram showing constructional details of Polymer Electrolyte Membrane Fuel cell (PEMFC) and compare its performance with Phosphoric Acid Fuel cell (PAFC). | [06] |

OR

| 3'(a)  | Explain the process of production of biogas from biomass? What are the main | [08] |

Contd...2.
advantages of anaerobic digestion of biomass? What are the factors affecting the performance of biogas digester?

Describe

3'(b) What is the present status of development of biomass energy resources in India? [04]

4(a) What are the most favourable sites for installing wind turbines? A propeller type wind turbine has free wind velocity of 12m/s at a height of 10m, air density = 1.226 Kg/m³, alpha = 0.14°, height of tower = 100m, Diameter of rotor = 80 metre, wind velocity at the turbine reduces by 20%, and generator efficiency = 85%. Find:
   (a) Total power available in wind,
   (b) power extracted by the turbine, and
   (c) electrical output power generated by the generator.

4(b) With the help of schematic diagram briefly describe the operation of open cycle MHD generating system.

5(a) Describe various methods of production of hydrogen for use as energy carrier. [04]

5(b) What are the major advantages of mini/micro-hydro resources? [04]

5(c) What is the source of tidal energy? What are the main hurdles in the development of tidal energy?
Maximum Marks: 60  
Credits: 04  
Duration: Three Hours

Answer all the questions. Assume suitable data if missing.

Question  

M.M.

1(a). Define “Lapse rate”. What are the atmospheric stability conditions? With the help of proper diagrams, describe the Plume behaviour as a function of atmospheric stability conditions. [08]

1(b). What do you understand by the term ‘Heat Island Effect’. Discuss its effect on large cities. [04]

OR

1'(a). Describe the role of atmosphere in relation to Earth, Sun and Pollution Effects. [07]

1'(b). For a combustion system, following information is given. Determine PINDEX (Tolerance Factor).

(Tolerance Factor)

| Particulate Matter (PM) | 143.0 | μg/m$^3$ | 375 |
| Sulphur Oxides (SO$_x$) | 123.0 | μg/m$^3$ | 1430 |
| Nitrogen Oxides (NO$_x$) | 136.0 | μg/m$^3$ | 514 |
| Carbon monoxide (CO) | 7250.0 | μg/m$^3$ | 40,000 |
| Hydrocarbons (HC) | 2157.0 | μg/m$^3$ | 19,300 |
| Oxidant (OOO) | 43.2 | μg/m$^3$ | 214 |
| Solar Radiation (SR) | 400.0 cal/cm$^2$-day |

2. What are the major pollutants emitted from combustion systems? Describe formation mechanism, effects and means of reduction of sulphur oxides. [12]

OR

2'. What do you understand by ‘Photochemical Smog’. Describe the nature of Photochemical smog and its effects. Also, discuss the results obtained from a smog chamber. [12]

Contd...2.
3. Describe the methods of sampling particulates by Sedimentation and High Volume Filtration. What do you understand by Iso-kinetic sampling conditions?

OR

3'. Explain with the help of line diagram, the Gas Filter Correlation (GFC) CO analyzer. What advantages it has over the conventional NDIR analyzer?

4(a). List the techniques used to remove particulates from polluted gas streams. Describe the Fabric Filters in detail.

4(b). A regenerative afterburner fuelled by methane having a calorific value of 50 MJ/kg, has to handle 9 m³/s of polluted air in such a way that the exhaust temperature should be 850 °C. The heat exchanger used has an effectiveness of 0.75. Determine the air-fuel ratio required and the temperature of exhaust gas leaving the regenerator.

5. Write short notes on any two of the following

(i) Evaporative emissions in petrol engines and their control
(ii) Factors affecting the emissions in diesel engines
(iii) Air pollution from gas turbines and jet engines

[FIGURE FOR QUESTION 4]

Specific enthalpy of air as a function of temperature. Datum temperature is 0°C.
Answer all the questions.  
Assume suitable data if missing.  
*Velocity triangles are must where needed.*  
*Notations used have their usual meaning.*

**Q.No.** | **Question** | **M.M.**  
--- | --- | ---  
1(a) | What are differences between reciprocating and centrifugal pump. | [04]  
1(b) | A centrifugal pump impeller has an outer dia 30 cm and inner dia 15 cm, runs at 1200 rpm. The vanes are set at an angle of 30° at the outlet. If the velocity of flow is constant at 2 m/s. Calculate:  
   (i) The velocity and direction of water at outlet.  
   (ii) The head developed when $\eta_{mano} = 0.85$.  
   (iii) The blade angle at the inlet. | [08]  
**OR**  
1' | A centrifugal pump lift water under a static lift of 40 m of which 3 m is suction lift. The suction and delivery pipes are both 35 cm dia. The friction loss in suction pipe is 2 m and in delivery pipe is 6 m. The impeller is 0.5 m dia and 3 cm wide at outlet and runs at the speed of 1200 rpm. The exit blade angle is 20°. If $\eta_{mano} = 85\%$, determine the pressure at the suction and delivery ends. | [12]  
2(a) | Differentiate among fans, blowers and compressors in terms of pressure ratio and approximate pressure ranges. | [04]
2(b) Air at a pressure of $10.1325 \times 10^4$ N/m$^2$ and a temperature of 288 K is compressed in a single stage turbo blower to $13.8 \times 10^4$ N/m$^2$. Calculate the work done per kg of air if the compression follows the law $p_v^{1.4} = \text{constant}$. Take $C_p = 1200$ J/kgK.

If the volume of free air compressed/minute by the blower is .1020 m$^3$ determine, (i) the power required to drive the blower and (ii) the adiabatic efficiency.

3 For an axial fan stage with downstream guide vanes derive the expression for (i) stage work, $W_s$ (ii) stage pressure coefficient, $\psi$ (iii) pressure rise in the rotor, $(\Delta p)_r$, (iv) Degree of reaction, $R$.

OR

3' A centrifugal fan has the data : inner dia of the impeller = 18 cm, outer dia = 20 cm, $N=1450$ rpm. The relative and absolute velocities at entry and exit are 20 m/s, 21 m/s, 17 m/s, 25 m/s, flow rate is 0.5 kg/s, motor efficiency is 78%. Determine:
(i) the stage pressure rise (ii) degree of reaction (iii) the power to drive the fan.

4 The conditions of air at the entry of an axial compressor stage are $p_1=768$ mm of Hg and $T_1=314$ K. The various angles are $\beta_1'=51^\circ$, $\beta_2'=9^\circ$, $\alpha_1'=\alpha_3'=7^\circ$. The mean dia and peripheral speed are 50 cm and 100 m/s. Mass flow rate through the stage is 25 kg/s, the work done factor is 0.95 and mechanical efficiency is 92 %, take stage efficiency 88 %, determine: (i) air angle at the stator entry (ii) blade height at the hub-tip dia ratio (iii) stage loading coefficient (iv) stage pressure ratio (v) power to drive the stage.

OR

4' Draw the h-s diagram for a complete axial flow compressor stage with $R > 1/2$ and prove that $R = 1/2 - 1/2( V_f / u) (\tan \alpha_1' - \tan \beta_2')$. What is surging in axial flow compressor? What are its effects?

5(a) Derive the relation for Euler's head for centrifugal pump.

5(b) A centrifugal pump delivers 1 cum of water/min at 1200 rpm. The impeller diameter is 35 cm and width at outlet is 1.3 cm. The pressure difference between inlet and outlet flanges is 2.8 kgf/cm$^2$. Calculate the blade angle of impeller at outlet. Take manometric efficiency as 63% and diameter of suction discharge pipe are equal also ($z_1 = z_2$)
2015-16
B.TECH. (AUTUMN SEMESTER) EXAMINATION
OPEN ELECTIVE (ELECTRONICS/COMPUTER/MECHANICAL/ELECTRICAL/
CHEMICAL/ARCHITECTURE/CIVIL ENGG)
ENTREPRENEURSHIP
ME-441

Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.  Question                                                M.M.
1(a) Define Entrepreneurship. Briefly describe some essential qualities of an [06]
      entrepreneur along with the reasons why people choose to become one.
1(b) Discuss the significance of small scale industries with a few examples. Also [06]
      highlight the inter-dependence between large and small scale industries.

2  Discuss in detail the strategic planning factors to be followed while drawing a  [12]
    detailed business plan.

   OR

2' Devise an exhaustive strategic plan for "Getting started in Food Business". The [12]
    plan should highlight the market segments, targeted market, customer needs of
    the targeted market, its positioning, strategic objectives, cost incurred in
    staffing, marketing etc and the revenue generated.
    (Cost incurred and the revenue generated has to be taken on an annual basis)

3 (a) Explain in detail the different elements of a sound Business plan.  [06]
3 (b) Discuss franchises as a business opportunity. Also highlight the advantages and [06]
      limitations of this business model.
4 (a) Write a detailed note on the importance of seed funding and angel investors for a new start-up.

4 (b) How's capital funding different from operational funding? Also discuss the various types of funds available for an entrepreneur.

OR

4'(a) Compare the Partnership and Sole Proprietorship business models on the basis of their advantages and limitations.

4'(b) Briefly describe the factors to be evaluated while buying an existing firm.

5(a) Write a detailed note on the importance of recruitment, selection and training of employees.

5 (b) Discuss the significance of promotional and advertising strategies of a new firm.
2015-16
B.Tech All Branches (I SEMESTER) EXAMINATION
Atmospheric Chemistry
AC-308

Maximum Marks: 60  Credits: 04  Duration: Three Hours

*Answer all the questions.*
*Assume suitable data if missing.*
*Notations used have their usual meaning.*

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<td>What is photochemical smog? Write the photochemical reactions involved in the formation of photochemical smog.</td>
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1'(a) Write short notes on any two of the following alternative fuels:
   (i) P-Series
   (ii) Biodiesel
   (iii) CNG

1'(b) What is the importance of indoor air quality? Describe the factors affecting the indoor air quality. | [5] |

2(a) What is clean air act? Define criteria pollutants and discuss the sources and significance of carbon monoxide/sulphur dioxide. | [5] |

2(b) Define particulate matter and give its classification. Describe the effects of particulate matter on human health. | [5] |

3(a) Why the gaseous pollutants are monitored? How CO or NH₃ are quantitatively estimated? | [5] |

3(b) Write a brief notes on any two of the followings:
   (i) Grab sampling and condensation
   (ii) Fourier Transform Infrared spectrometry | [2.5x2] |
(iii) Atomic Absorption Spectrometry

4 (a) What is the principle of wet collectors? Explain cyclone scrubber method in air pollution control.

4 (b) Discuss any two of the followings in brief:

(i) Fabric filters
(ii) Venture scrubber
(iii) Electrostatic precipitator

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6 (a) What is the significance of Green House effect? Describe the various regional impacts of global warming.

6 (b) Discuss the formation and depletion of ozone.
2015-16
DEPARTMENT OF CIVIL ENGINEERING
B.Tech. VII Semester Examination
Project Management CE-484 (Open Elective)

Maximum Marks: 60
Duration: Three Hours

Note: (i) Answer ALL Questions
(ii) All parts of a question should be attempted in one continuation in one copy
(iii) Answer to any part of the question should begin from FRESH page
(iv) All questions carry equal marks
(v) Assume any data if not given

Q. 1 (a) Write down the definition of the project given by Project Management Institute USA and UNIDO
(b) Define and discuss following types of estimates with degree of accuracy and application of each type
   (i) Order of Magnitude Estimate
   (ii) Approximate Estimate
   (iii) Detail Estimate
(c) Explain various factors of production in brief

Q. 2 (a) Explain six inherent nature of a project in detail
(b) Define the following types of cost with example (6x1=6)
   (i) Direct Cost
   (ii) Fixed Cost
   (iii) Opportunity Cost
   (iv) Conversion Cost
   (v) Sunk Cost
   (vi) Historical Cost

Q. 3 (a) Explain the following terms, used as measure of Central Tendency in statistical analysis
   (i) Arithmetic Mean (ii) Geometric Mean (iii) Mode
   Also mention suitability of use of each concept along with inherent type of data and phenomenon under study with example
(b) In figure -1, a network for a construction project is given along with optimistic, most likely and pessimistic time estimates. On the basis of data given in network calculate the following:
i. Expected time of the project having completion probability of 50%

ii. Determine the critical path

Q.4 (a) What do you understand by the term specification? Explain different types of specifications used in industry with example
(b) What are the different general economic considerations to be kept in mind during purchasing?

OR

Q.4' (a) In what ways commercial purchasing is different from household purchasing?
(b) What are the various issues to be examined, during the purchase of Capital Equipment?

Q.5 (a) Discuss concept of wage and its types in detail
(b) Discuss basic philosophy of various types of rewards offered in lieu of achievement to a worker in the industry

OR

Q.5' (a) Write down detailed account on the evolution of HRM in India
(b) Discuss various elements of HR Planning

---

![Network Diagram](image)

**Fig. 1**