Total No. of Questions : **08** Roll No. : 0701.....

B.Tech FIRST SEMESTER EXAMINATION JUNE-2025

(Branch : Civil & Mechanical Engineering)

CH-1402 ENGINEERING CHEMISTRY

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) Explain hardness of water. Discuss types of hardness and its measurement. List the various disadvantages of hard water used in various industries. ***07***

(b) Write down various chemical reactions involved in lime-soda process of water softening. ***04***

(c) A sample of hard water provide following results : ***03***

(i) Calcium bicarbonate = 162 ppm
(ii) Calcium chloride = 111 ppm
(iii) Magnesium bicarbonate = 146 ppm
(iv) Magnesium chloride = 95 ppm
(v) Calcium sulphate = 136 ppm
(vi) Magnesium sulphate = 120 ppm
(vii) Potassium chloride = 149 ppm

Calculate lime and soda required for softening of 10,000 liters of water sample.

2(a) How ultimate analysis of coal is carried out in laboratory? Write down significance of this method. ***07***

(b) What is knocking of fuel? Report its significance and improvement measures of anti-knocking characteristic of fuel. ***07***

3(a) Write down the functions of lubricant. Explain boundary lubrication mechanism with suitable examples.

(b) Write down academic notes upon following lubricating properties :

(i) Aniline point (ii) Iodine value.

4(a) Discuss chemistry of natural rubber and their draw backs. Write down process of vulcanization of natural rubber and discuss its advantages. ***08***

(b) Write down preparation, properties and uses of followings : ***06***

(i) Nylon.6 (ii) Urea formaldehyde.

5(a) Describe the manufacture of Portland cement by wet process. ***07***

(b) What is corrosion of metals? Describe mechanism of electrochemical corrosion and compare it with chemical corrosion. ***07***

6 Write short notes upon following : ***14***

(i) Viscosity and viscosity index (ii) Setting & hardening of cement
(iii) Biodegradable polymer (iv) solid lubricants.

P.T.O.

7 Draw neat and labeled sketches of following : ***14***

(i) Penskey-Marten's flash point apparatus
(ii) Assembly of ion-exchange process of water softening
(iii) Assembly of moving-bed type catalytic cracking
(iv) Table to exhibit – Type and extent of alkalinity of water due to various anions

8 Discuss the difference between the followings : ***14***

(i) Gross and net calorific value of fuels
(ii) Low temperature and high temperature carbonization
(iii) Phosphate conditioning and calgon conditioning of internal treatment of water
(iv) Thermoplastic and thermosetting plastic.

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Total No. of Questions : **08** Roll No. : 0701.....

B.Tech FIRST SEMESTER EXAMINATION JUNE-2025

(Common for CE/CM/ME/EC/EE branches)

MA-1401 / MA-1301 MATHEMATICS - I

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) Find the evaluate of the curve $y^2 = 4ax$, where $\boldsymbol{a}$ is positive constant. ***07***

(b) The line segment $x = sin^2t,\ \ y = cos^2t,\ 0 \le t \le \frac{\pi}{2}$, is revolved about the y-axis. Find the surface area of the solid generated. ***07***

2(a) Show that : $\beta(m,n) = \beta(m+1,n) + \beta(m,n+1)$. ***07***

(b) Evaluate the following improper integrals : ***07***

(i) $\int_0^\infty \sqrt{x}e^{-x^2}dx$, (ii) $\int_0^\infty e^{-x^2}dx$ In terms of Gamma functions.

3(a) State and prove Cauchy's mean value theorem. ***07***

(b) (i) Evaluate: $\lim_{x\to 0}\frac{xe^x - \log_e(1+x)}{x^2}$, ***07***

(ii) Prove that: $\lim_{x\to 0}\left(\frac{\tan x}{x}\right)^{1/x^2} = e^{\frac{1}{3}}$.

4(a) Apply Maclaurin's theorem to prove that $\log_e secx = \frac{1}{2}x^2 + \frac{1}{12}x^4 + \frac{1}{45}x^6 + \cdots$ ***07***

(b) Find the Fourier series expansion of the periodic function ***07***

$$f(x) = x, \quad -\pi \le x \le \pi, \quad f(x+2\pi) = f(x).$$

5(a) Express : $f(x) = x^2$ as half range cosine series for $0 < x < 2$. ***07***

(b) (i) Determine the convergence or divergence of $\sum_{n=1}^{\infty}\frac{\sqrt{n}}{n^2+1}$. ***07***

(ii) Use the integral test to determine sum of the following series if the series converges $\sum_{n=1}^{\infty}\frac{1}{n^2+1}$.

6(a) Show that the function ***07***

$$f(x) = \begin{cases} \frac{x-y}{x+y}, & (x,y) \neq (0,0) \\ 0, & (x,y) = (0,0) \end{cases}$$ is discontinuous at the point $(0,0)$.

(b) Find the directional derivative of $f(x,y,z) = xy^2 + 4xyz + z^2$ at the point $(1,\ 2,\ 3)$ in the direction of $3\,i + 4j - 5\dot{k}$. ***07***

P.T.O.

7(a) Discuss the maximum and minimum of the function $f(x,\ y) = x^3 + y^3 - 3xy$. ***07***

(b) Using the elementary operations, determine the rank of the matrix ***07***

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 5 \\ 1 & 5 & 5 & 7 \\ 8 & 1 & 14 & 17 \end{bmatrix}$$

8(a) Solve the following system of linear equations : ***07***

$$\begin{aligned} x - \ y + \ z &= 1 \\ 2x + \ y - \ z &= 2 \\ 5x - 2y + 2z &= 5. \end{aligned}$$

(b) Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & 0 \\ -1 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$ and use it to find A^{-1}. ***07***

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Total No. of Questions : **08** Roll No. : 0701.....

B.Tech FIRST/SECOND SEMESTER EXAMINATION JUNE-2025

(Common for All Branches)

EE-1401 / EE-1301 BASIC ELECTRICAL ENGINEERING

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) Calculate the direction and magnitude of the current through the 5Ω resistance between point A and B by using nodal method as shown in ***fig.1***. ***07***

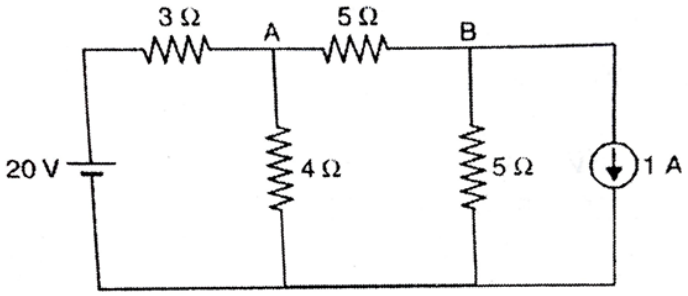


Fig.1

(b) Find the current across AB terminal by using Thevenin's theorem of the circuit shown in ***fig.2***. ***07***

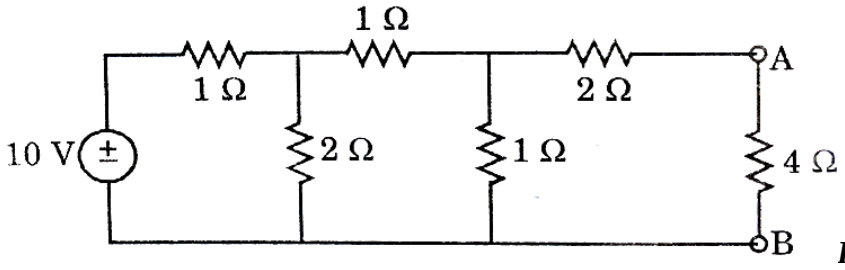
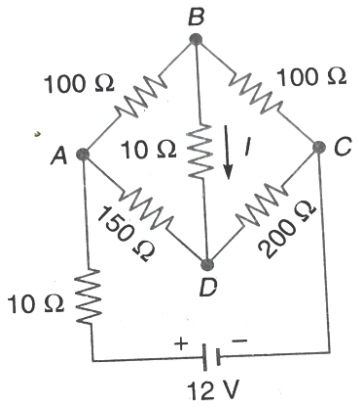


Fig.2

2(a) What is the superposition theorem? State and explain it, and also mention its limitations. ***07***

(b) Find the current through 10Ω resistance across BD by using mesh analysis method of the circuit shown in ***fig.3***. ***07***



3(a) Explain the following terms with the reference of an alternating quantity : ***07***

(i) Active power (ii) Apparent Power (iii) Reactive Power (iv) RMS value.

(b) Draw the phasor diagrams for a R-L-C series circuit energized by a sinusoidal voltage showing the relative positions of the current, components voltages and the applied voltage for the following cases : (i) $X_L > X_C$ (ii) $X_L < X_C$ (iii) $X_L = X_C$. ***07***

P.T.O.

4(a) Write down the relation between line voltage and line current with phase voltage and phase current in star-connected circuit. ***07***

(b) A chock coil of resistance 10Ω and inductance 0.05H is connected in series with a capacitor of 100 μF. The whole circuit has been connected to 200V, 50Hz supply. Determine : (i) impedance (ii) current drawn from supply (iii) power input (iv) power factor of circuit (v) apparent and reactive power of the circuit. ***07***

5(a) Define the following : (i) Flux (ii) m.m.f. (iii) flux density (iv) reluctance (v) fringing (vi) B-H curve ***07***

(b) A steel ring of circular section of 1 cm in radius and having a mean circumference of 94.3 cm and air gap of 1 cm long. It is uniformly wound with an exciting coil consisting of 600 turns and excited with a current of 2.5 amps. Neglecting magnetic leakage. Calculate : ***07***

(i) MMF (ii) magnetic flux (iii) reluctance (iv) flux density
(v) relative permeability of steel.

Assume that steel part takes about 40% of total amp-turns.

6(a) Do the comparison of electric and magnetic circuits on the basis of similarities and dissimilarities. ***07***

(b) What is the working principle of a transformer? Also, draw and explain its phasor diagram for a lagging power factor load. ***07***

7(a) What are the open circuit test and short circuit test? Explain their purpose and procedure. ***07***

(b) A transformer is rated at 20kVA. At full load its copper loss is 400W and its iron loss is 350W. Calculate : ***07***

(i) The efficiency at full load, unity p.f.
(ii) The efficiency at half load, 0.8 p.f.
(iii) The efficiency at 70% full load, 0.8 p.f.

8(a) Explain the working principle of 3-phase induction motor. Explain in detail. ***07***

(b) List the different parts of a DC machine and describe the function of each. ***07***

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Total No. of Questions : **08** Roll No. : 0701.....

B.Tech FIRST/SECOND SEMESTER EXAMINATION JUNE-2025

(Common for All branches)

ME-1402 ENGINEERING GRAPHICS AND CAD

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Assume suitable data missing, if any. Use answer book for writing CAD.

1(a) The distance between two points on a map is 5 cm. The real distance between them is 20 metres. Draw a diagonal scale to measure up to 60 m and show a distance of 43.6 m on it. ***07***

OR

Construct a scale of chords showing 5° divisions and with its aid set-off angles of 45° and 155°.

1(b) Inscribe the largest possible ellipse in a rectangle of sides 160 mm and 100 mm. ***07***

OR

The directrices of a hyperbola are 50 mm apart and the vertices are 70 mm apart. Locate the asymptotes and foci graphically and construct two branches of the hyperbola.

2 A 70 mm long line AB is inclined at 30º to the H.P. The end A is 15 mm in front of the V.P. and 25 mm above the H.P. The front view of the line measures 45 mm. Draw the projections of the line AB and determine its true angle of inclination with the V.P. ***14***

3 A hexagonal plane of side 30 mm has a corner on the HP. Its surface is inclined at 45° to the H.P. and the top view of the diagonal through the corner which is in the H.P. makes an angle of 60° with the V.P. Draw its projections. ***14***

4 A pentagonal pyramid of base side 30 mm and axis 60 mm has an edge of base parallel to H.P. Its axis is parallel to V.P. and inclined at 45° to the H.P. Draw its projections when the apex lies in the H.P. ***14***

5 A pentagonal pyramid of base side 30 mm and axis 60 mm is resting on its base on the H.P. with an edge of the base parallel to the V.P. It is cut by a section plane perpendicular to the V.P., inclined at 60° to the H.P. and bisecting the axis. Draw its front view and sectional top view and true shape of the section. ***14***

6 A square hole of side 25 mm is cut in a cylindrical drum of diameter 50 mm and height 70 mm. The faces of the hole are inclined at 45° to the H.P. and axis intersects with that of the drum at right angles. Draw the development of its lateral surface. ***14***

P.T.O.

7 Discuss the drawing and editing commands in AUTO-CAD system. ***07***

Discuss the major functions to be performed by a computer aided drafting systems and advantages of CAD. ***07***

8 The front and top views of an angle plate are shown in ***fig.1***. Draw its isometric view. ***14***

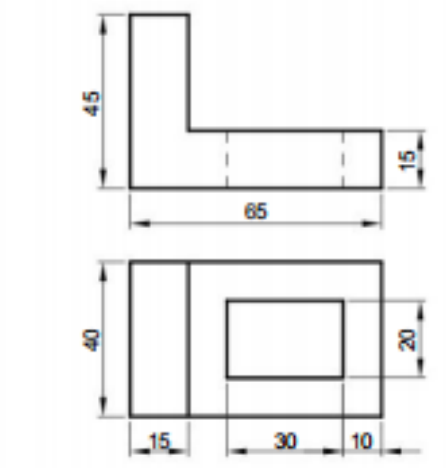

Fig.1 *(All dimensions are in mm)*

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Total No. of Questions : **08** Roll No. : 0701.....

B.Tech FIRST/SECOND SEMESTER EXAMINATION JUNE-2025

(Common for All Branches)

EN-1401 ENGLISH

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) Define communication and explain its process with a suitable diagram. ***04***

(b) Discuss the different types of communication with examples. ***04***

(c) Consider a scenario where employees in a multinational company often misunderstand each other's emails due to differences in language and cultural expressions. Identify the type of barrier this represents and suggest measures to overcome it. ***06***

2(a) Explain the importance of phonetics in effective communication. ***04***

(b) What are the etiquettes to be followed during a telephonic conversation? ***04***

(c) Prepare a short oral presentation (2-3 minutes) on "The Role of Technology in Modern Communication" for a group of first-year engineering students. Explain how you would use phonetics to enhance your delivery. ***06***

3(a) What are soft skills? Why are they essential for professional excellence? ***04***

(b) Differentiate between interpersonal and intrapersonal communication. ***04***

(c) Analyze the following case study and discuss the communication strategies used by the leader : ***06***

Case Study :

In a civil engineering firm, a team of five engineers was assigned to design a small bridge for a local community. The team leader, Rudra Sharma, observed that the structural engineers and the environmental impact analysts were not collaborating effectively, leading to delays and conflicting design proposals. To improve communication, Rudra implemented the following strategies :

(i) Organized weekly cross-functional meetings where each subgroup presented their progress and challenges.
(ii) Set up a shared digital workspace for real-time access and feedback on each other's work.
(iii) Encouraged informal coffee breaks for casual discussions among team members. Within a month, the team developed a cohesive design that met all requirements and was approved by the client.

Discuss how these strategies will contribute to the team's success.

4(a) Explain the concept of time management. ***04***

(b) Create a weekly time management plan for a first-year engineering student who needs to balance exam preparation, a group project, and extracurricular activities. Include specific techniques such as prioritization, scheduling, and avoiding procrastination. ***04***

(c) How can self-awareness contribute to personal and professional growth? ***06***

P.T.O.

5(a)	What are the characteristics of a formal letter?	***04***
(b)	Explain the importance of email etiquette in business communication.	***04***
(c)	You purchased a laptop from XYZ Electronics, but it stopped working after one month. Despite contacting customer service, you have not received a satisfactory response. Write a complaint letter to the company's manager.	***06***
6(a)	Describe the format of a résumé.	***04***
(b)	What are the key points to keep in mind while writing a quotation letter?	***04***
(c)	Write an application letter for the post of Junior Engineer at ABC Construction Company. In your letter, highlight the communication skills you have learned in this course that make you a suitable candidate.	***06***
7(a)	What is précis writing? Explain its significance.	***04***
(b)	Differentiate between a lab report and a survey report.	***04***
(c)	Write a technical description of the process of 3D printing in about 150 words.	***06***
8(a)	Write a slogan to promote renewable energy adoption.	***04***
(b)	List six components of a technical report.	***04***
(c)	Write a short project report on designing a solar-powered water heater for a rural community. Include the abstract, introduction, methodology, results and conclusion.	***06***

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