

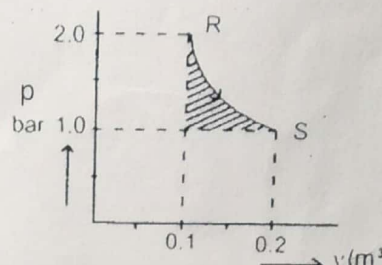
1/1

An ideal gas undergoes an isothermal expansion from state R to state S in a turbine as shown in the diagram given below:

CO2

1

The area of shaded region is 1000 Nm. What is the amount of turbine work done during the process?

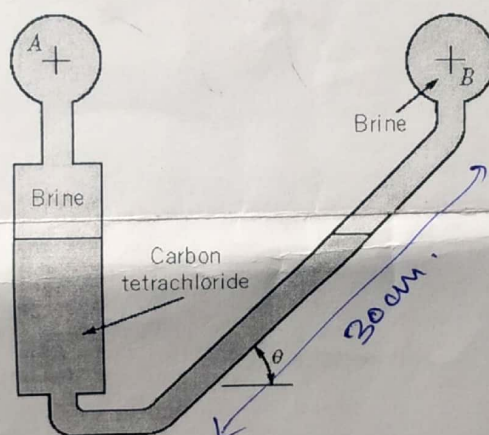


2/

The inclined differential manometer of figure below contains carbon tetrachloride (SG = 1.5). Initially the pressure differential between pipes A and B, which contain a brine (SG = 1.1) is zero as illustrated in the figure below. It is desired that the manometer give a differential reading of 30 cm (measured along the inclined tube) for a pressure differential of 689.5 Pa. Determine the required angle of inclination, θ .

CO1

6



3/

A platinum wire is used as a resistance thermometer. The wire resistance was found to be 10 ohm & 16 ohm at ice point and steam point respectively, & 30 ohm at sulphur boiling point (444.6 °C). Find the resistance of the wire at 500 °C, if the resistance varies with temperature by the relation:

CO1

5

$$R = R_0(1 + \alpha t + \beta t^2)$$

4

A single-cylinder, single-acting, 4 stroke engine of 0.15 m bore develops an indicated power of 4 kW when running at 216 rpm. Calculate the area of the indicator diagram that would be obtained with an indicator having a spring constant of 25×10^6 N/m³. The length of the indicator diagram is 0.1 times the length of the stroke of the engine.

CO2

6

OR

4/

A gas compressed from $v_1 = 0.3$ m³, $p_1 = 1$ bar to $v_2 = 0.1$ m³, $p_2 = 3$ bar. Pressure and volume are related linearly during the process. For the gas, find the work, in kJ.

CO2

6

Time: 01 Hour

Maximum Marks: 25

Note:

- (i) Attempt all questions. Assume any suitable data, if needed.
- (ii) Symbols have their usual meanings.
- (iii) Marks allotted to each question and course outcome (CO) covered are indicated against each question.

Q. No.

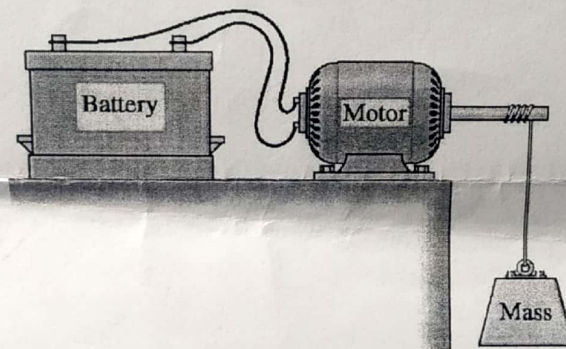
Question

CO

M. M.

1(a)

As illustrated in figure below, electric current from a storage battery runs an electric motor. The shaft of the motor is connected to a pulley-mass assembly that raises a mass. Considering the **motor as a system**, identify locations on the system boundary where the system interacts with its surroundings and describe changes that occur within the system with time. Repeat for an enlarged system that also *includes the battery and pulley-mass assembly*.



1(b)

The work done by a system is a function.

CO2

1

1(c)

The mean effective pressure on an engine piston is to length of the indicator diagram.

CO1

1

1(d)

The thermometric property of a constant-volume gas thermometer is

CO1

1

1(e)

In a steady state steady flow process taking place in a device with a single inlet and a single outlet, the work done per unit mass flow rate is given by,

CO2

1

$$\omega = \int_{\text{inlet}}^{\text{outlet}} \nabla dp$$

Where ∇ is the specific volume and p is the pressure. The expression for ω given above:

- (a) Is valid only if the process is both reversible and adiabatic
- (b) Is valid only if the process is both reversible and isothermal
- (c) Is valid for any reversible process
- (d) Is incorrect.

B. Tech. (Autumn Semester)
Mid Semester Examination
EEA1110 (Principles of Electrical Engineering)

Time: 01 Hour

Maximum Marks: 25

Note:

- (i) Attempt all questions. Assume any suitable data, if needed.
- (ii) Symbols have their usual meanings.
- (iii) Marks allotted to each question and course outcome (CO) covered are indicated against each question.

Q. No.	Question	CO	M. M.
1.	An inductive coil having resistance of $8\ \Omega$ and inductance of $80\ \text{mH}$, is connected in series with a capacitance of $100\ \mu\text{F}$ across $150\ \text{V}$, $50\ \text{Hz}$ supply as shown in Fig. 1. Calculate, (a) the current, (b) the power factor, and (c) the voltages drops across the coil.	CO1	06

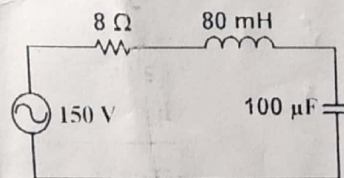


Fig. 1

378.30 / 112.40

2.	State Superposition theorem and find the current through $6\ \Omega$ resistance of Fig. 2 using Superposition theorem.	CO1	06
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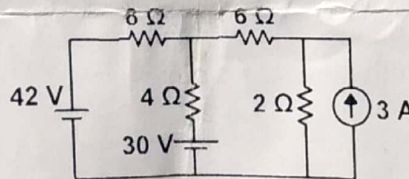


Fig. 2

3.	If the $12\ \Omega$ resistor of Fig. 3 draws a current of $1\ \text{A}$, find the value of ' R ' by applying Norton's theorem.	CO1	05
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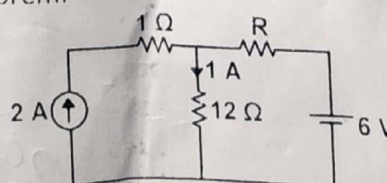


Fig. 3

4.	With the help of phasor diagram, derive the relation between line and phase currents in delta connected three phase circuit.	CO1	05
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5.	The initial capacitor voltage of Fig. 4 is zero. Find the steady state voltage across the capacitor if the switch is closed at $t=0$.	CO1	03
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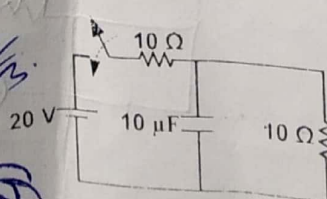


Fig. 4

No. of Questions: 5
 No. of Pages: 1

2018-19
B. Tech. (Autumn Semester)
Mid Semester Examination
ACS 1110/AC 111 (Applied Chemistry)

Time: 01 Hour

Maximum Marks: 25

Note:

- (i) Attempt all questions. Assume any suitable data, if needed.
- (ii) Symbols have their usual meanings.
- (iii) Marks allotted to each question and course outcome (CO) covered are indicated against each question.

Q. No.	Question	CO	M. M.
1(a)	What are the requirements for a good disinfectant? Write chemical equations for disinfection of water by bleaching powder and chloramine.	CO1	04
1(b)	Calculate the temporary and permanent hardness of a sample of water containing the following impurities: $\text{CaCl}_2=50.5 \text{ mg/L}$; $\text{MgSO}_4=55 \text{ mg/L}$; $\text{KCl}=2.4 \text{ mg/L}$; $\text{SiO}_2= 9 \text{ mg/L}$; $\text{Ca}(\text{HCO}_3)_2= 11.2 \text{ mg/L}$; $\text{Mg}(\text{HCO}_3)_2= 8.6 \text{ mg/L}$ and $\text{Na}_2\text{SO}_4= 9.2 \text{ mg/L}$. (Atomic weights: H=1; C= 12; Ca= 40; Mg =24; Na= 23; K= 39; Cl= 35.5; O= 16; Si= 28 and S= 32)	CO1	04
1(c)	Explain the terms: Break-point chlorination and Caustic embrittlement.	CO1	06
2(a)	Define corrosion? Give its significance.	CO2	04
OR			
2(a)	What is wet corrosion? Discuss the mechanism of electrochemical corrosion by evolution of hydrogen.	CO2	
2(b)	Mention the requirements of good paint. Discuss the characteristics and functions of pigment.	CO2	04
2(c)	Define Pilling Bedworth rule. Give its significance.	CO2	03

40+

CaCl_2	111
MgSO_4	120
SiO_2	60
$\text{Ca}(\text{HCO}_3)_2$	162
$\text{Mg}(\text{HCO}_3)_2$	146

Mid Semester Examination 2018-19

B.Tech. First Year

Environmental Studies (CEA1110/ CE111)

Attempt All Questions

Maximum Marks 25

Time: One Hour

Q	Section A	Marks
1.	Describe the consumptive use value as biodiversity as medicines, fuels and fibers with suitable examples.	4
2.	What is biodiversity and why must we conserve it?	4

OR

2'	What are the different types of biodiversity? Explain any one.	4
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Section B

3.	Write a short note on water pollution (sources, effects and control) and also make the list (only name) of various physical, chemical and biological water quality parameters?	4
4.	Explain briefly various effects and control of soil and thermal pollution?	4

OR

4'	Explain briefly the causes and control of marine and nuclear pollution?	4
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Section C

5.	Give an account of classification of forest, what measures should be taken for conservation of forest resources?	5
6.	What is green revolution? What are the remedial measures for solving food problems in India?	4

OR

6'	What is salinity? Give a brief account of factors responsible for salinity and its effect on agriculture.	4
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2018-2019
B. Tech. I Year (Autumn Semester)
Mid-Semester Examination
AMS-1110 (Applied Mathematics)

Time: 1 hour

Note: (i) Attempt all questions.

Max. Marks: 25

(ii) Symbols have their usual meanings.

(iii) Marks allotted to each question and course outcome (CO) covered are indicated against each question.

Q. No. Question

- 1(a) Define the rank of a matrix. For what values of k the system of linear equations
 $x + y + z = 1$, $2x + y + 4z = k$, $4x + y + 10z = k^2$
 have a solution and solve them in each case.

CO M.M.

CO1 [06]

5

- 1(b) Examine whether the matrix A is diagonalizable. If so obtain the matrix P such that $P^{-1}AP$ is a diagonal matrix.

CO1 [07]

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$

OR

- 1(b') Find the characteristic equation of the matrix

CO1 [07]

2

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$$

and hence compute A^{-1} . Also find the matrix represented by $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ and evaluate it.

- 2(a) If $y = e^{m \cos^{-1} x}$, show that

CO2 [06]

$$(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - (n^2 + m^2)y_n = 0.$$

5

Also find $(y_n)_0$.

- 2(b) Expand $\sin x$ in powers of $(x - \frac{\pi}{2})$ by Taylor's theorem and hence find the value of $\sin 91^\circ$ correct to 4 decimal places.

CO2 [06]

OR

- 2(b') Find the asymptotes of the curve $x^3 + 3x^2y - 4y^3 - x + y + 3 = 0$.

CO2 [06]

6

$$\begin{array}{l} k^2 - 3k + 2 = 0 \\ k^2 - 2k - k + 2 = 0 \\ k(k-2) - 1(k-2) = 0 \\ (k-2)(k-1) = 0 \\ k = 2, 1 \end{array} \quad \left[\begin{array}{ccc|ccc} 1 & 3 & -4 & -1 & 1 & 3 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{array} \right]$$