

First/Second Semester B.E./B.Tech. Degree Examination, June/July 2026 Applied Chemistry for Smart Systems (CSE)

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. VTU Formula Hand Book is permitted.*

Module – 1			M	L	C
Q.1	a.	Describe the construction and working principle of a pentacene-based organic semiconductor memory chip.	6	L2	CO1
	b.	Explain the synthesis of TiO ₂ nanomaterials by the sol-gel method for Resistive Random Access Memory (ReRAM) and draw the flow diagram neatly.	7	L2	CO1
	c.	Summarize the construction, working principle, and applications of AMOLED display technologies.	7	L2	CO1
OR					
Q.2	a.	What are liquid crystals? Classify liquid crystals and explain their characteristic properties and applications in display systems.	6	L1	CO1
	b.	Define organic semiconductors? Explain the types of organic semiconductors used in memory devices, with detailed discussion of n-type perfluoropentacene.	7	L2	CO1
	c.	Describe the construction and working principle of Quantum Light Emitting Diodes (QLEDs) with a neat diagram, and discuss their advantages and applications in modern display technology.	7	L2	CO1
Module – 2					
Q.3	a.	Explain the size-dependent properties of quantum dots with reference to quantum confinement effect, surface-to-volume ratio, and band gap variation.	6	L2	CO2
	b.	Describe the construction, working principle, and applications of Quantum Dot Sensitized Solar Cells (QDSSCs) with a neat labeled diagram.	7	L2	CO2
	c.	Explain the synthesis, properties, and advantages of Nylon 6,6 in 3D printing applications.	7	L1	CO2
OR					
Q.4	a.	In a sample of a polymer, 50 molecules have the molecular mass 2×10^3 g/mol, 100 molecules have the molecular mass 4×10^5 g/mol, 150 molecules have the molecular mass 8×10^7 g/mol. Calculate the number average and weight average molecular mass of a polymer and also, find the Polymer dispersity index.	6	L3	CO2
	b.	Discuss the synthesis of Cadmium Selenide quantum dots by the wet chemical method and explain their applications.	7	L2	CO2
	c.	Discuss the synthesis of Polyaniline, its conduction mechanism, and engineering applications.	7	L2	CO2

Module – 3

Q.5	a.	What are concentration of cells? The EMF of cell $\text{Cd} \text{CdSO}_4(x) \text{Cd}(0.0625\text{M}) \text{Cd}$ is 0.025V at 28°C. Find the value of x with cell reaction.	06	L3	CO3
	b.	Discuss the construction, working principle and application of sustainable energy devices in clean energy generation of Solid Oxide Fuel Cell?	07	L2	CO3
	c.	Explain the production of green hydrogen by photocatalytic water splitting using Titanium Dioxide and discuss its advantages.	07	L2	CO3

OR

Q.6	a.	What are batteries? Classify batteries and explain the types of batteries with examples.	6	L1	CO3
	b.	Describe the construction, working principle, and applications of an ultra-small asymmetric supercapacitor used in IoT and wearable devices.	7	L2	CO3
	c.	Discuss the construction and working principle of a Sodium-ion battery and explain its applications in electric vehicles.	7	L2	CO3

Module – 4

Q.7	a.	Write a note (i) transducers (ii) actuators, and (iii) sensors, with example.	6	L1	CO4
	b.	Describe the principle, construction, and working of electrochemical gas sensors and explain their application in the detection of NO _x and SO _x in air samples.	7	L2	CO4
	c.	What is CPR? A thick sheet of area 400 inch ² is exposed to air near the ocean. After a 1.5 years it was found to experience a weight loss of 660 g due to corrosion, if the density of the steel is 7.85 g/cm ³ . Calculate the corrosion penetration rate in mpy and mmpy (Given K = 534 in mpy and 87.6 mm/y).	7	L3	CO4

OR

Q.8	a.	Describe the principle, construction, and working of a conductometric sensor, and explain its application in the estimation of acid mixtures.	6	L2	CO4
	b.	What are biosensors? Write the construction, working of biosensors used to detect glucose in blood.	7	L2	CO4
	c.	Define electrochemical theory of corrosion? Explain the differential metal corrosion and differential aeration corrosion with neat diagram.	7	L2	CO4

Module – 5

Q.9	a.	Explain the sources and composition of e-waste, and discuss its effects on the environment and human health.	6	L1	CO5
	b.	Discuss the synthesis and properties of Alginate Hydrogel and its uses in Brain Computer Interfaces (BCIs) applications.	7	L2	CO5
	c.	Discuss the synthesis and properties of glycerol trioleate ester and its uses in IT infrastructure applications.	7	L2	CO5

OR

Q.10	a.	Explain the synthesis, properties, and applications of Polylactic Acid as a biomaterial.	6	L2	CO6
	b.	Describe the green synthesis of Zinc Oxide nanoparticles and discuss their applications in magnetic RFID and Internet of Nano Things (IoNT) system.	7	L2	CO6
	c.	Discuss the extraction of gold from e-waste by the bioleaching method and explain its advantages over conventional methods.	7	L2	CO6
