Basavarajeswari Group of Institutions

2022 SCHEME

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN										Course Code	2	2	C	H	E	M	1	2	/	2	2

First / Second Semester B.E. Degree Summer Semester Examinations, September/October 2025

CHEMISTRY FOR MECHANICAL ENGINEERING STREAM

Duration: 3 hrs **Max. Marks: 100**

Note: ***1. Answer any* FIVE *full questions, choosing* ONE *full question from each module.***
2. Use of Chemistry Formula Handbook is permitted.
3. Missing data, if any, may be suitably assumed.

Q. No		*Question*	*Marks*	*(RBTL:CO:PI)*
		Module-1		
1.	**a.**	Define solar cell. Explain construction, working of a solar cell.	**06**	**(2 :1 : 1.2.1)**
	b.	With neat figure describe production of hydrogen by electrolysis of water.	**06**	**(2 :1 : 1.2.1)**
	c.	Define calorific value. Apply bomb calorimeter for the determination of calorific value of a fuel.	**08**	**(3 :1 : 1.2.1)**
		(OR)		
2.	**a.**	Discuss construction, working and applications of lithium-ion battery.	**06**	**(2 :1 : 1.2.1)**
	b.	Describe the construction, working and applications of methanol-oxygen fuel cell.	**06**	**(2 :1 : 1.2.1)**
	c.	On burning 1.15 g of a solid fuel in bomb calorimeter following data were observed: Increase in the temperature of the water = 2.5^{o}C, Water equivalent of stirrer, bomb etc., = 450 g, Weight of the water in the calorimeter = 4500 g % of hydrogen = 5 %, Specific heat of water= 4.187 KJ/Kg/^{o}C, latent heat of steam = 2454 KJ/Kg. Calculate GCV & NCV of the fuel sample.	**08**	**(3 :1 : 1.2.1)**
		Module-2		
3.	**a.**	Define metal finishing. Mention technological importance of metal finishing.	**06**	**(2 :2 : 1.2.1)**
	b.	Discuss differential aeration corrosion taking pitting corrosion as an example.	**06**	**(2 :2 : 1.2.1)**
	c.	When a metal plate of area 250 inches square exposed to corrosive environment, it undergoes a weight loss of 550 g after one year. The density of the steel sheet is 7.9 g/cm^{3}. Given that, K-value for mmy and mpy are 87.6 and 534 respectively. Calculate CPR in both mpy and mmy.	**08**	**(3 :2 : 1.2.1)**
		(OR)		
4.	**a.**	Define galvanisation. Explain the process of galvanisation with neat figure.	**06**	**(2 :2 : 1.2.1)**
	b.	Define electroplating. Explain electroplating of chromium.	**06**	**(2 :2 : 1.2.1)**

Note: (**RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI - Performance Indicator)**

	c.	A plate of steel alloy was found submersed in sea water. The original area of the plate was 650 cm^2 and approximately 8.5 Kg had been corroded away during the submersion. Assuming a corrosion penetration rate of 6.5 mm/yr for this alloy in sea-water. Calculate the time of submersion in years. The density of alloy is 4.5 g/cm^3, (K=87.6 for mmy).	**08**	**(3 :2 : 1.2.1)**

Module-3

5.	**a.**	Explain addition polymerisation and condensation polymerisation with suitable reaction.	**06**	**(2 :3 : 1.2.1)**
	b.	Explain the synthesis, properties and applications of PVC.	**06**	**(2 :3 : 1.2.1)**
	c.	A polymer sample has three different chains out of which, 200 molecules have molecular weight 2000, 300 molecules have molecular weight 3000, 400 molecules have molecular weight 4000, 500 molecules have molecular weight 5000, Calculate number average and weight average molecular weight of the polymer.	**08**	**(3 :3 : 1.2.1)**
		(OR)		
6.	**a.**	Explain the synthesis, properties and applications of Kevlar.	**06**	**(2 :3 : 1.2.1)**
	b.	Explain the synthesis, properties and applications of lubricants.	**06**	**(2 :3 : 1.2.1)**
	c.	Calculate number average and weight average molecular weight of the polymer. A polymer sample consisting of 2,4,6,8 polymer chains of molecular weights of 2×10^3, 4×10^3, 6×10^3, 8×10^3, respectively.	**08**	**(3 :3 : 1.2.1)**

Module-4

7.	**a.**	Explain theory and Instrumentation of potentiometry.	**06**	**(2 :4 : 1.2.1)**
	b.	Explain Instrumentation and application of colorimetry in estimation of copper.	**06**	**(2 :4 : 1.2.1)**
	c.	Discuss phase diagram for lead-silver system.	**08**	**(3 :4 : 1.2.1)**
		(OR)		
8.	**a.**	Explain theory and Instrumentation of Conductometry.	**06**	**(2 :4 : 1.2.1)**
	b.	Explain determination of pH of beverages using pH sensors (Glass electrode).	**06**	**(2 :4 : 1.2.1)**
	c.	Define phase rule and explain the terms phase, component, and degree of freedom with examples.	**08**	**(3 :4 : 1.2.1)**

Module-5

9.	**a.**	Explain the synthesis of nano particles by co-precipitation method.	**06**	**(2 :5 : 1.2.1)**
	b.	Explain size dependent properties of anno-particles with reference to surface area, catalytic and thermal properties.	**06**	**(2 :5 : 1.2.1)**
	c.	Write properties and applications of carbon nano-tubes and graphene's.	**08**	**(3 :5 : 1.2.1)**
		(OR)		
10.	**a.**	Discuss properties and applications of stainless steel.	**06**	**(2 :5 : 1.2.1)**
	b.	Write a note on the properties and applications of Perovskites.	**06**	**(2 :5 : 1.2.1)**
	c.	Define nano-particles. Explain the synthesis of nano particles by sol-gel process.	**08**	**(3 :5 : 1.2.1)**

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