This question paper contains 5 printed pages.

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Your Roll No. .....

B.Tech. (M) / I **J**

Paper III— CHEMISTRY

(EME–103)

Time : 3 hours *Maximum Marks* : 70

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any five questions.
All questions carry equal marks.

1. (*a*) Discuss the construction of Quinhydrone electrode and show that it behaves as a form of Hydrogen electrode. 2,2

(*b*) Write principle of Potentiometric titration. Describe Potentiometric redox *or* neutralization titration in detail. 2,4

(*c*) A zinc rod is placed in 0·1 M zinc sulphate solution at 298 K. Calculate:

(*i*) Potential of the electrode if

$$E^{o}_{Zn^{+2}\rightarrow Zn} = -0 \cdot 76 \text{ V}.$$

(*ii*) EMF of the cell when this electrode is coupled with Cu^{+2} (1·75 M)/Cu electrode

P. T. O.

$E^{\circ}_{Cu^{+2}\rightarrow Cu} = -0{\cdot}34$ V. Represent the cell and write net cell reaction also. 2,2

2. (*a*) Describe the synthesis of a stereospecific polymer. 3

(*b*) Give name and structure of the appropriate polymers for the following applications (any *two*):

(*i*) Non-stick coating

(*ii*) Wrinkle resistant fibre

(*iii*) Optical lenses

(*iv*) Lubricating oil. 5

(*c*) Write preparation, properties and applications of any *two* of the following:

(*i*) Novolac

(*ii*) Hypalon

(*iii*) Polycarbonate

(*iv*) Kevlar. 6

3. (*a*) Deduce the kinetic equation for a certain reaction,

$$2A+3B \rightarrow 4C,$$

which is found to be first order with respect to each reactant. 4

(*b*) Calculate the difference in activation energies if velocity constant of above reaction is found 10 times in the presence of catalyst at 27° C. 4

(*c*) Define velocity of reaction and report its measurement on the basis of collision theory. Explain the influence of temperature and concentration of reactants on velocity of reaction. 6

4. (*a*) Draw a DTA curve of hydrated calcium oxalate and discuss its salient feature in detail. 3

(*b*) With the help of neat block diagram, discuss instrumentation and working of TGA. 4,4

(*c*) Which thermal technique will give information about:

(*i*) Phase transformations

(*ii*) Drying temperatures

(*iii*) Composition of a mixture. 3

5. (*a*) Giving an example write informative note on the invariant system. 3

(*b*) When various mix. of metal A and metal B in the form of melt were cooled, the following freezing points were observed:

%A	100	90	80	70	60	50	40	30	20	10	0
Freezing point (°C)	240	225	210.5	195	180	166	150	162	175	188	200

(*i*) Draw Phase diagram. (*ii*) What is Eutectic temperature? (*iii*) What is Eutectic composition? 6

(*c*) State Nernst Distribution Law. Explain its applications in detail. 5

6. (*a*) Explain in brief (any *three*):

(*i*) Applications of IR Spectroscopy

(*ii*) Precessional Frequency

(*iii*) Principle of Raman Scattering Spectroscopy

(*iv*) Origin of X-rays. 9

(*b*) For each of the following compounds predict the number of ^1H NMR signal. Give reason in support of your answer.

(*i*) $CH_3-CH_2-CH_3$

(*ii*) CH_3-CH_2-Cl

(*iii*)
$$CH_3-\underset{\displaystyle Cl}{\underset{|}{CH}}-CH_3$$

(*iv*) $ClCH_2-CH_2-CH_2Cl$

(*v*) $CH_3-\underset{\underset{O}{||}}{C}-CH_3$ 5

7. (*a*) Explain any *three* of the following in brief:

(*i*) Drop Point

(*ii*) Lubricating Emulsion

(*iii*) Hydrodynamic Lubrication

(*iv*) Viscosity Index. 7

(*b*) What are Solid Lubricants? Giving examples discuss their advantages and action of lubricants. 4

(*c*) Which type of lubricant is applied for:

(*i*) Gears

(*ii*) Refrigerator system? 3

8. Write short notes on any *two* of the following:

(*i*) UV-Vis Spectroscopy

(*ii*) Concentration Cell

(*iii*) Molding of Plastics

(*iv*) Factors Influencing Adhesive Action

(*v*) Phase Diagram of $FeCl_3-H_2O$ System. 2×7