UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DTP 1014
COURSE	: INTRODUCTION TO POLYMER
SEMESTER/SESSION	: 2-2024/2025
DURATION	: 3 HOURS

Instructions:

1. This booklet contains **5** questions. Answer **ALL** questions.
2. All answers should be written in the answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 3 PRINTED PAGES INCLUDING THE COVER PAGE

QUESTION 1

a) Explain the following terms (6 Marks)

i. Monomer
ii. Polymer
iii. Basic hydrocarbon

b) Describe the structure of the polymers (4 Marks)

c) Identify the repeat unit of the following polymers. (10 Marks)

i. Polyethylene (PE)
ii. Poly(vinyl chloride) PVC
iii. Polytetrafluoroethylene (PTFE)
iv. Polypropylene (PP)
v. Polystyrene (PS)

QUESTION 2

a) Calculate the number average of molecular weight (M_n) and weight average molecular weight (M_w) for 9 moles with molecular weight = 30,000 and 5 moles with molecular weight = 50,000. (8 Marks)

b) Discover **FIVE** (5) techniques of molecular weight determination. (5 Marks)

c) Sketch the schematic diagram for Nuclear Magnetic Resonance (NMR) spectroscopy. (7 Marks)

QUESTION 3

a) Differentiate between addition and condensation polymerization. (10 Marks)

b) Explain the term copolymerization. (2 Marks)

c) Describe **FOUR** (4) types of copolymers.spectroscopy. (8 Marks)

QUESTION 4

a) Express the schematic equation of the following polymerization reactions:

i. Step-growth polymerization (3 Marks)

ii. Chain-growth polymerization (3 Marks)

b) Discuss the difference between Chain-Growth and Step-Growth polymerization reactions. (8 Marks)

c) Sketch the difference between batch reactor, continuous stirred tank reactor (CSTR) and plug flow reactor (PFR). (6 Marks)

QUESTION 5

a) Explain the differences between natural rubber and synthetic rubber. Provide examples of applications where each type of rubber is commonly used. (6 Marks)

b) Describe the vulcanization process in rubber manufacturing and provide examples of vulcanized rubber applications. (6 Marks)

c) Discuss the process of manufacturing polymer matrix composites. Explain the steps in combining the polymer matrix and reinforcing fibers to create a composite material. (8 Marks)

----------END OF QUESTIONS ----------