



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI-ABUJA
FACULTY OF SCIENCE
DEPARTMENT OF COMPUTER SCIENCE
2024 I EXAMINATION

COURSE CODE: CIT 831
COURSE TITLE: SOFTWARE ENGINEERING METHODOLOGY
CREDIT UNIT: 3
TIME ALLOWED : 3HRS
INSTRUCTION: ANSWER QUESTION ONE AND ANY THREE OTHERS

1. With the aid of the diagram explain Rapid application development (RAD) model of Software Development Lifecycle
 - 2a. List five (5) Issues of Software Prototyping Model and explain any two
 - 2b. Explain two (2) issues in 2a above
 - 3a. List and discuss the two categories of software requirements
 - 3b. Discuss the two (2) categories in 3a above
4. List and explain the requirements validation techniques you know.
 - 5a. Define Architectural Design
 - 5b. What is Software Architecture?
 - 5c. What is a Sub-System?
 - 6a. Explain Software Development with Re-use
 - 6b. List three (3) Requirements for Re-use

QUESTION 3

- (a). State six characteristics of ionic solids (5 marks)
- (b). The ionic radii of Mg^{++} and S — respectively are 0.65 \AA and 1.84 \AA . Calculate the force of attraction between these ions. Given: $e = 1.6 \times 10^{-19} \text{ C}$, $\epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2/\text{N}\cdot\text{m}^2$ (5 marks)
- (c). The energy vs. wave vector (E-K) relationship near the bottom of a band for a solid can be approximated as, $E = A(ka)^2 + B(ka)^4$ where the lattice constant $a = 2.1 \text{ \AA}$. At the bottom of the conduction band, show that the effective mass of the electron is

$$m^* = \frac{\hbar}{2Aa^2}$$

(5 marks)

QUESTION 4

- (a). State four assumptions of Drude model (4 marks)
- (b). In a Hall effect experiment, show that the hall voltage for an intrinsic semiconductor is negative. (4 marks)
- (c). The Fermi energies of two metals X and Y are 5 eV and 7eV and their Debye temperatures are 170 K and 340 K , respectively. The molar specific heats of these metals at constant volume at low temperatures can be written as $(C_v)_X = \gamma_X T + A_X T^3$ and $(C_v)_Y = \gamma_Y T + A_Y T^3$ where γ and A are constants. Assuming that the thermal effective mass of the electrons in the two metals are same, find the values of $\frac{\gamma_X}{\gamma_Y}$ and $\frac{T_X}{T_Y}$. (7 marks)

QUESTION 5

- (a) State five principal irregularities in the appearance of superconductivity. (4 marks)
- (b). Derive the London equation for super fluidity of current in a superconducting solid. (7 marks)
- (c). Suppose a solenoid constructed out of Nb_3Al which has $B_{c2} = 32.0 \text{ T}$ at $T=0\text{K}$ and critical temperature $T_c = 18\text{K}$. The wire has a radius of 1.0 mm and is wound on a hollow cylinder of diameter 8.0 cm and length 90.0 cm with 150 turns/cm. What is the maximum current the solenoid can carry if its temperature is maintained at $T=15\text{K}$ and it remains superconducting. (4 marks)

Explain the groundwork that researchers make ahead of analyzing gathered data for any qualitative type study. **(10 Marks)**

(b). Case studies draw from as many data sources as possible to give in-depth investigation to an event, issue or phenomenon under research scrutiny. It is preferred when a researcher seeks to understand beyond ordinary level and can be historical, clinical, observational or multi-case studies. Explain why researchers will seek to carry out any kind of case study. **(10 Marks)**