University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination Fall 2022
M.Sc. in Civil Engineering Program

Course Code: CE 6108 — Time: 1 (one) Hour
Course Title: Advanced Design of Concrete Structures — Full Marks:60

QUESTION 1 [10 MARKS]

Formulate flexural (moment) design equation (including maximum steel ratio) for high strength (50 MPa)) concrete using ultimate limit state approach of ACI 318 or BNBC 2020. $[\beta_1 = 0.85 - 0.007143(f_c' - 28)]$. [10 Marks]

QUESTION 2 [20 MARKS]

The floor system of an office building (live load 2.4 kN/m^2) is required to be constructed with waffle slab as shown in **Figure 1**. The panels are supported with columns (700 mm x 700 mm) and walls. The floor carries 3 kN/m^2 dead load due to partition walls and finishes (excluding self-weight of slab). Considering all the design requirements of BNBC (deflection, punching shear), **propose a solution for the minimum thickness** of the waffle slab (slab and rib or solid slab near column). [20 Marks]

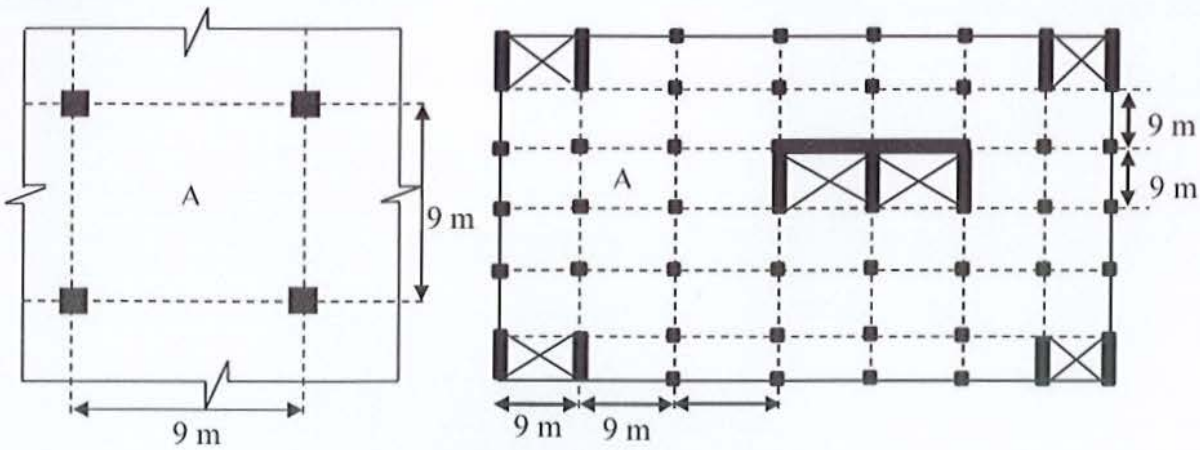

Figure 1. Floor plan system

QUESTION 3 [30 MARKS]

The floor system of the building stated in **Question 2** may construct with one way Joist/Ribbed slab. Design the **rib (only)** of the slab for **Panel A** as shown in **Figure 1**. Assume required data to design the rib. The moment and shear force coefficients of rib are shown in the **Table**.

[30 Marks]

Action	Positive (at mid span)	Negative (at support)
Moment	$\frac{wl^2}{16}$	$\frac{wl^2}{11}$
Shear	$\frac{wl}{2}$	

University of Asia Pacific
Department of Civil Engineering
Midterm Examination: Fall 2022
Program: M.Sc. Engineering (Civil)

Course Title: Statistical Method in Hydrology | Course Code: CE 6605
Time: 1 hour | Credit Hour: 03 | Full Marks: 40

---

1. Briefly define the following with example. **10**
a) Hydrologic systems; (b) Hydrologic variables; (c) Samples and populations; (d) Discrete Random Variables (e) Continuous Random Variables

2. A series of soil moisture data is prepared by collecting samples from two different sources. Though the sources are random for any month, a total of 600 samples are obtained from source A that contains 3% erroneous data and a total of 400 samples are obtained from source B that contains 1% erroneous data. **10**

a) What is the probability that the data for a month selected at random is obtained from source A?
b) What is the overall percentage of erroneous data?
c) An erroneous data is selected at random, what is the probability that it is from source-A?

3. A storm event occurring at a point in space is characterized by two variables, namely the duration X of the storm and the depth of rainfall Y. The variables X and Y follow following distribution where $x \geq 0$ and $y \geq 0$, respectively:

$$F_X(x) = 1 - e^{-x}$$
$$F_Y(y) = 1 - e^{-2y}$$

The joint CDF of X and Y is assumed to follow the bivariate distribution where x, $y \geq 0$ given as **10**

$$F_{X,Y}(x,y) = 1 - e^{-x} - e^{-2y} + e^{-x-2y-xy}$$

Find out the cumulative marginal probability function of X and Y as well as the joint pdf of X and Y.

4. **(a)** What is the probability that a flood with return period 10 years will occur once in 4 years? **5**

(b) An Engineer has two possible proposals to consider for the construction of an embankment. The details of the two proposals are given in Table 1. Which proposal should be considered for an economic design? **5**

Design Parameters/Information	*Proposal 1*	*Proposal 2*
Return period	5 years	10 years
Flood magnitude	1400 m^3/s	2200 m^3/s
Time period of occurrence of the event once, such that the facility can be repaired with the revenue earned without any loss	Once in 8 years	Once in 15 years

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall 2022
Program: Master of Science in Civil Engineering (MSc in CE)

Course Title: Computer Methods in Civil Engineering | Credit Hour: 3 | Course Code: CE 6004 | Full Marks: 100
Time: 1 hour

Answer all questions below. The numbers in brackets next to the questions indicate allocated marks.

1. Computers have made the works of engineers much easier, but we should still have a good understanding of how the computer is doing the works.
    a. We should not blindly trust a software to solve a problem – why? How to check the validity of a computer solution? (12)
    b. Briefly describe three examples of incorrect use of computer software that resulted in catastrophic failures. (13)
2. Linear algebra is used for solving many common engineering problems.
    a. What is linear algebra? (5)
    b. How many simultaneous equations are required at a minimum to find the values of 100 unknown variables? Why? (8)
    c. Maximum how many simultaneous equations can we practically solve by analytical methods (i.e. manually)? (5)
    d. What is a matrix? (7)
3. We use polynomial equations for modelling engineering systems.
    a. In an nth order polynomial of variable x, what will be the highest power of x? Write the general form of the equation. (8)
    b. How many common methods are available for finding the roots of polynomials? Illustrate the bracketing method with graphs. (No need to derive any equation) (8)
    c. Illustrate graphically the following situations i) no root, ii) one root, iii) two roots, iv) three roots. (9)
4. Regression analysis and curve fitting are helpful numerical tools.
    a. What is the most common type of regression analysis? Write the general form of the function (equation) for it and illustrate it with a diagram. (8)
    b. What kind of function do we normally use for modelling cyclic loading (such as earthquakes or tidal waves)? (8)
    c. Name three types of Fourier series and draw diagrams for all. (9)

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall 2022
Program: Master in Civil Engineering

Course code: CE 6006
Course title: Environmental Hazard and Disaster Management

Time: 60 Minutes | Total marks: 20

Answer all questions

1. Do you agree that only due to human activities hazards can become a disaster? Justify your answer. 5

2. Explain the relationship between *hazards*, *vulnerability*, *coping capacity* and *disaster risk* with practical examples. 5

3. In engineering point of view, in between "disaster risk management" and "disaster management" concepts which one is more effective for reducing hazards and vulnerability and increasing coping capacity against flood related hazards along the coastal region of Bangladesh? Justify your answer with practical examples. 5

4. Explain different steps of *disaster risk assessment*. 5