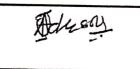
# FACULTY OF ENGINEERING DEPARTMENT OF CIVIL ENGINEERING FIRST SEMESTER EXAMINATION (MARCH 2018) 2017/2018 ACADEMIC SESSION



HOD'S SIGNATURE

#### Instructions:

1) Answer 5 questions in full-3 questions from part A and 2 questions from B

2) Time Allowed: 3 Hours

3) SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAMINATION

Course Title: CIVIL ENGINEERING AND SYSTEMS ANALYSIS AND DESIGN

**Course Code: CVE 531** 

## ERSITY ELIZADE UNIVERSITY ILARA-MOKIN DEPARTMENT OF CIVIL ENGINEERING

### Second Semester 2017/2018 Session

## CVE 531: CIVIL ENGINEERING AND SYSTEMS ANALYSIS AND DESIGN

Time Allowed: 3HOURS

Instruction: Answer 5 questions in full-3 questions from part A and 2 questions from B

#### **PART ONE**

#### Question 1 (20 marks)

- a) Describe 'project' and list the different phases of a typical civil engineering project. (10marks)
- b) What are the various form of a construction project usually available to a civil engineering project management? (5 marks)
- c) Describe briefly the role of each construction team for a civil engineering project. (5 marks)

#### Question 2 (20 marks)

- a) What is meant by time value of money when dealing with project cost and analysis? (5 marks)
- b) Define the following terms related to time value of money
  - i. Interest
  - ii. Interest Rate
  - iii. Equivalence
  - iv. Present Worth
  - v. Annual Worth (15 marks)

#### Question 3 (20 marks)

a) For a civil engineering project, if an amount R naira is invested for years at an interest rate (i), to yield a future sum (S), show that: (10 marks)

$$R = S\left[\frac{i}{(i+1)^n - 1}\right]$$

b) From (a) above, show that the uniform end of the year payments R which can be secured for n years from a present investment (p), at interest rate (i). is

$$R = P\left[\frac{i(1+i)^n}{(1+i)^n - 1}\right] = \left[i + \frac{i}{(i+1)^n - 1}\right]$$

- a) Define or briefly outline the following concept:
  - i. Systems
  - ii. Systems analysis
  - iii. System design
  - iv. Civil engineering systems
  - v. Optimization (10 marks)
- b) Outline 5 examples of civil engineering systems, indicating how each can be regarded as a system. (10 marks)

#### Question 5 (20 marks)

- a) Define linear programming as an optimization technique, writing a mathematical LP model with the description of terms or variables used. (5 marks)
- b) What are conditions that must be satisfied to be able to use LP to solve optimization problems? (5 marks)
- c) Outline 5 practical applications of linear programming. (5 marks)

#### **PART B**

#### Question 6 (20 marks)

Solve the following problems by LP techniques, assuming all x<sub>i</sub> to be non-negative

a) Maximize  $Z = 30x_1 + 20x_2$ 

Subject to: 
$$-x_1 + x_2 \le 5$$

$$2x_1 + x_2 \le 10$$
 (5 marks)

b) Minimize  $Z = 5x_1 - 20x_2$ 

Subject to: 
$$-2x_1 + 10x_2 \le 5$$

$$2x_1 + 5x_2 \le 10$$
 (5 marks)

(c) Maximize the daily output in producing x<sub>1</sub> chairs by process P<sub>1</sub> and x<sub>2</sub> chairs by process P<sub>2</sub> subject to

$$3x_1 + 4x_2 \le 550$$
 (machine hours)

$$5x_1 + 4x_2 \le 650$$
 (labour hours)

5mrks

(d) Maximize the daily profit in producing x₁ metal frames F1 (profit ₹ 900 per frame) and x₂ frame F2 (profit ₹ 500 per frame)

 $X_1+3x_2 \le 18$  (materials)  $X_1 + x_2 \le 10$  (machine hours)  $3x_1 + x_2 \le 24$  (5 marks)

#### Question 7 (20 marks)

- State the conditions for the existence of maxima and minima for function with two variables. (10 a) marks)
- The profit (z) of a firm depends upon the level of output (Q) and the advertising expenditure (A). b) Assuming the second order derivative conditions are satisfied. find the profit maximizing values of Q given the following relationship  $Z=800 - 3Q^2 - 4Q + 2QA - 5A^2 + 48A$ . What is the maximum profit? (10 marks)

Question 8 (20 marks)

Design an optimum trapezoidal canal to convey water for which the cross-sectional area A 10m<sup>2</sup>. (note that the mean velocity increases with hydraulic radius  $R = \frac{A}{P}$ , where P is the wetted perimeter. The discharge is maximum; hence the design optimization reduces to maximizing the wetted perimeter).

#### Question 9 (20 marks)

- A young engineer has estimated that his earnings should average № 600,000, № 1,000,000 and № a) 1,500,000 per year in succeeding decades from the time he takes his first job after graduation. Allow 3 percent interest compounded annually each for cost of money and return. Determine
  - i. Present worth (at graduation) in cash of the 30 years earnings.
  - ii. Equivalent uniform annual value of the 30 years estimated income. (10 marks)
- Determine the total amount of money that an engineer must pay on the day his son is born, into an b) account bearing an interest of 5% to be compounded annually in order provide payment of N 20,000 on each of the son's 18th, 20th and 21th birthdays. Determine the equivalent worth of the four ₩ 20,000 payments as of the son's 24th birthdays. (10 marks)