Subject: - Computational Techniques in Civil Engineering *(CE751)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt *All* questions.
✓ The figures in the margin indicate *Full Marks*.
✓ Assume suitable data if necessary.

Group A (Water)

1. Derive the finite difference equations for full Saint-Venant equations representing the fluid flow using second order accurate explicit scheme. [6]

2. Describe numerical dispersion, diffusion and stability of Finite Difference Schemes. The value of flow rate Q at four points in the space time grid are shown in the figure below. Determine the value of first-order derivations $\partial Q/\partial t$ and $\partial Q/\partial x$ by using four-point implicit method. Given: $\Delta t = 1$ hour, $\Delta x = 600$ m and $\theta = 0.55$ [4+4]
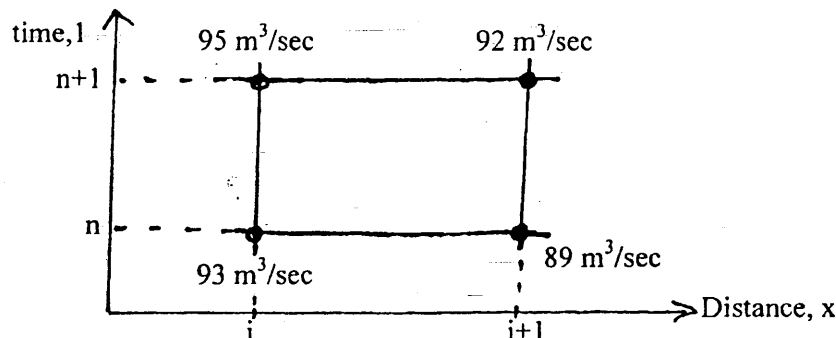
3. What do you understand by characteristic curve? Explain, A pipe of diameter 35 cm carrying water has the following data at two points A and B: $V_A = 6$ m/sec, $V_B = 6.25$ m/sec, $p_A = 102$ KN/m^2, $p_B = 124$ KN /m^2, $\Delta x = 500$ m, $\Delta t = 0.5$ sec, $f = 0.02$, $a = 1000$ m/sec $\left(\dfrac{dx}{dt} = \pm a\right)$, elevation difference between A to P = 2.50 m. By the use of finite difference form of characteristics equation, compute the velocity and pressure at point P. [2+6]
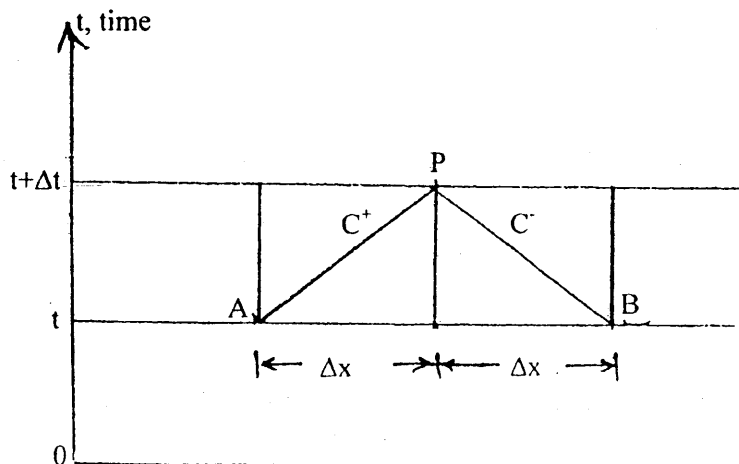
Group B (Structure)

5. Describe the concepts and applications of finite element and finite difference method with their advantages and disadvantages with other methods of numerical computations used in solving civil engineering problems. [3+3+2]

6. Describe briefly about the Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT). Carry out the three iterations of conjugate gradient method for the following system of linear equations: [4+4]

$$\begin{bmatrix} 10 & -6 & 0 \\ -6 & 8 & -2 \\ 0 & -2 & 5 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \\ x_3 \end{Bmatrix} = \begin{Bmatrix} 12 \\ 0 \\ 0 \end{Bmatrix}$$

7. a) Describe about the plane stress, plane strain and axisymmetric problems with their examples and constitutive relations to be used for stress analysis problems. [2+2+2]

   b) Differentiate between isotropic and anisotropic material body. Derive the expressions for Lame's constants for linearly elastic isotropic material body. [2+2]

8. A propped cantilever beam is loaded as shown in figure below. Discretize the beam into two elements and find deflection at point B and rotations at point B and C. Also check the result using single element model. Take EI as constant throughout the beam. [6+4]
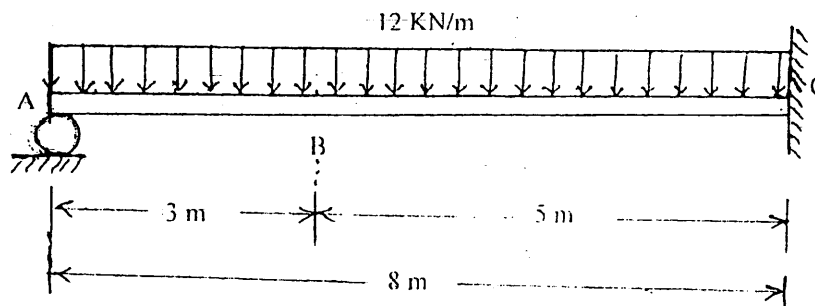
9. What is isoprametric formulation? Obtain shape functions N, for the eigth-noded rectangular element as shown in figure below. [1+5]
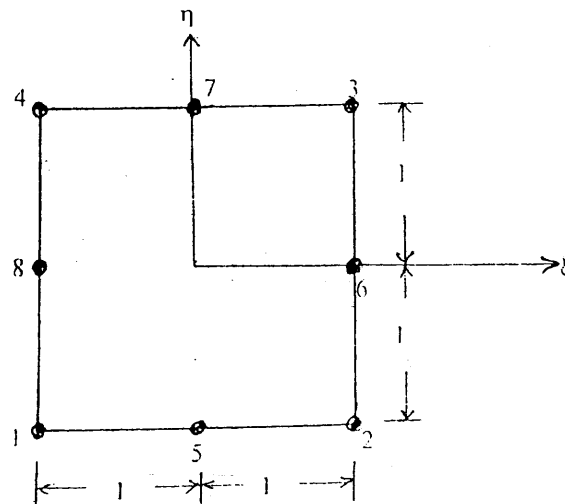
10. A steel plate of thickness 10 mm is being loaded as shown in figure below. Considering the plane stress condition, determine the stresses and strains at the centroid of the CST element. Take $E = 210 \times 10^3$ MPa, $V = 0.30$ and unit weight of steel is 78.50 KN/m³. length of each side = 100 mm.   [10]
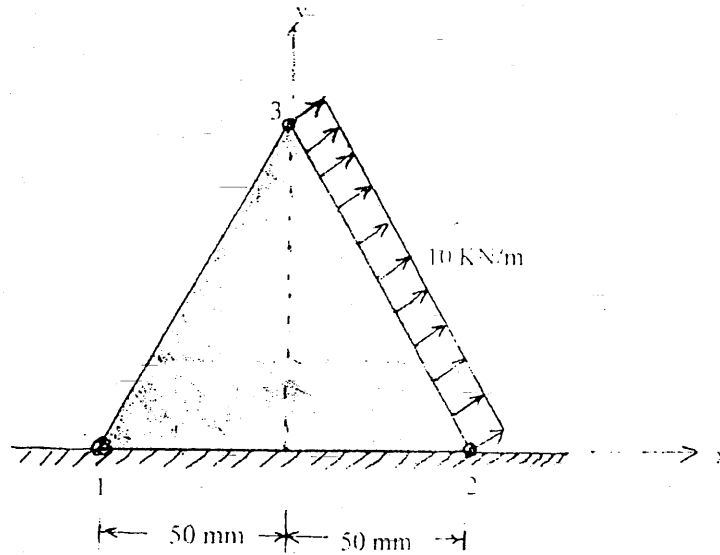
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Exam.		Regular	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Construction Management *(CE754)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt __All__ questions.
✓ The figures in the margin indicate __Full Marks__.
✓ Assume suitable data if necessary.

1. a) Define client and discuss the role of a client during pre tender stage. [4]

   b) What is time-cost trade off? Explain the use of time cost trade off with example. [6]

2. a) What do you mean by ABC classification of materials? Discuss importance of material management. [5]

   b) Discuss with examples cash-flow management during construction of project. [5]

3. a) Write advantages and disadvantages of using equipment in construction work. [5]

   b) Write short notes on grader and dragline. [5]

4. a) Name types of contract and discuss the use of BOOT contracts the context of Nepal. [6]

   b) What is pre-qualification of contractor's and why it is necessary. [4]

5. a) Describe the types of maintenance in a project and explain the importance of maintenance of already built projects. [6]

   b) What is communication in a project? Discuss its importance. [4]

6. a) What are different types of specification you are aware of rite the importance of specification. [6]

   b) Discuss the use of earned value analysis's for performance control in a project. [4]

7. a) What is valuation? Write different methods of valuation. [6]

   b) What is material handling system and why is it useful in construction work. [4]

   ### OR

   Discuss most important two roles each of client, consultant and contractor. [4]

8. Write short notes on: (any two) [5×2]

   i) National building code
   ii) Advantage and disadvantage of centralization
   iii) Labor productivity control

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Exam.		**Regular**	
Level	BE	Full Marks	40
Programme	BCE, BGE	Pass Marks	16
Year / Part	IV / II	Time	1 ½ hrs.

Subject: - Technology Environment and Society *(CE753)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt _All_ questions.
✓ _All_ questions carry equal marks.
✓ Assume suitable data if necessary.

1. What are the elements for the sustainable development? How can you say Indigenous technology are sustainable in case of Nepal·

2. Discuss about the major environmental issues of Nepal. How can we reduce air pollution of Kathmandu?

3. What are the primary reasons for human interventions in the ecosystem?

4. Describe causes and Impacts of climate change. How can we protect our National Parks and Conservation Areas .

5. How do you describe the LEP Approach for the development of Nepal? Explain advantages and disadvantages of LEP Approach.·

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6

Subject: - Engineering Professional Practice *(CE752)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt __All__ questions.
✓ The figures in the margin indicate __Full Marks__.
✓ Assume suitable data if necessary.

1. (a) Write down in brief the Characteristics Features of Society. What are the elements of Community. (5)

   (b) What are the duties and Liability of an Engineer and Architect? (5)

2. (a) What do you understand by Negligence, Tort and Liability. What are the elements of Negligence. (5)

   (b) Define Ethics. What is moral and non-moral action? Write briefly the perspectives of Professional ethics. (5)

(3) (a) What are the methods of recruitment of consultant. Explain the purpose of **EOI and RFP.** (5)

   (b) Define Contract. What are the "essentials elements in the Valid Contract? (5)

(4) A RCC Bridge was designed by the Designer on behalf of Consultant. This was Constructed by the reputed "A" Class contractor. After the Completion of the Construction, traffic was allowd on the bridge. After Six Months of operation there were crack in the Bridge. A Probe Team was established by Road department. The Design Procedure was Okay, but it was found that quality of steel material used was not duly tested. The Contractor argued that the procedure of construction was in accordance with the instruction of Engineer and specification. There was also lack of proper supervision by the Consultant. The Design load for the Bridge was 20 tons. It was also reported that there happen to pass more than 20 tons vehicles also. The Consultant was good friend of Contractor. Being a member of Probe Team, what is your judgment on the failure of this bridge? (10)

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Exam.		Regular	
Level	BE	Full Marks	40
Programme	BCE, BGE	Pass Marks	16
Year / Part	IV / II	Time	1 ½ hrs.

Subject: - Technology Environment and Society *(CE753)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt any **Five** questions.
✓ **All** questions carry equal marks.
✓ Assume suitable data if necessary.

1. What is appropriate technology? How technological advancement places impact on environment and society? Describe briefly the characteristics of information society.

2. What are the sources, causes and impacts of air pollution? Discuss about the importance of health education.

3. Discuss about the climate change and adaptation measure from Nepalese perspective.

4. Discuss the role of an engineer in community development.

5. Explain the technology provides shift in employment.

6. What is organic pollution in water? Discuss in detail aerobic digestion and anaerobic digestion with practical examples.

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Exam.		Regular	
Level	BE	Full Marks	40
Programme	All (Except B.Arch.)	Pass Marks	16
Year / Part	IV / II	Time	1 ½ hrs.

Subject: - Engineering Professional Practice *(CE752)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt __All__ questions.
✓ The figures in the margin indicate __Full Marks__.
✓ Assume suitable data if necessary.

1. a) What are the major activities to be governed by the society for its survival? Illustrate the impacts of computer on Nepalese society. [4]

   b) Explain how individual freedom balances societal goals. [4]

2. a) What do you mean by Profession? Explain its characteristics. [4]

   b) What is ethics? Write in short the code of ethics for engineering profession. [4]

3. a) What are the preparations to be made before inviting competitive bidding notice? How the contract can be interpreted in case of ambiguity? Define percentage contract and in which category of procurement, this form of contract is adopted? [4]

   b) What is intellectual property right? Write in briefly the working hour provision of labour law. Differentiate between public and private company. [4]

4. a) Explain business law and labour law in Nepal. [4]

   b) Explain globalization and cross cultural issues. [4]

5. Write short notes on: (Any four) [2×4]

   a) Jurisdiction of Nepal Engineering Council
   b) Job description of fresh graduates
   c) Detailed duties and liabilities of an engineer and architect
   d) Nepal Engineers Association
   e) Society and development

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Exam.		Regular	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Construction Management (CE 754)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.

1. a) Write down the function of construction project management in context of Nepal as Nepal needed more infrastructure planning and development. [4]

   b) The details of a project are shown below. If the indirect cost per week is Rs. 300, find the optimal crashed result of the project network. [6]

Activity	immediate Predecessor(s)	Time (Weeks)		Cost (Rs.)	
		Normal	Crash	Normal	Crash
A	-	7	4	1800	2100
B	-	9	7	3500	3800
C	B	5	4	2500	2625
D	A	8	5	4000	4225
E	C	9	8	3000	3325
F	B	11	11	3000	-

2. a) Explain about ABC classification of construction material graphically. How the value of a construction materials can be analysed on the basis of value engineering? Discuss it. [3+3]

   b) Write down the factors to be considered for deciding the extent of mechanisation of construction project. Write short notes on equipment used for highway and pavement construction. [4+4]

3. a) Name contract types and reimbursable contract. Write down the activities to be carried out as preparation before inviting tendering. [4+4]

   b) List down the various components for site preparation, and prepare a typical arrangement facilities of a building construction project in Urban area of Nepal. [4]

4. a) Define material productivity and write down the basic reasons for material productivity control in construction project. [4]

   b) Explain and differentiate between site order book and measurement book. What is muster roll and why it is important? [2+2]

5. a) Write down the objectives of the maintenance. Explain in details about planning and scheduling of maintenance in project maintenance. [2+3]

   b) Define personnel management. Write down the steps of personnel selection in any organisation. [2+4]

6. a) Why specification is important in construction contracts? Write down the specification for Stone masonary work in 1: 6 mortar.   [2+4]

   b) Why regulatory requirements are needed in any construction project? How building codes of any country helps in effective urban planning, explain it.   [4]

   OR

   Discuss about safety requirements in a construction site.

7. Define value of any property and what is to be satisfied by any property to have its value. A person desire to sale his property having details as: Gross rent = Rs 5000 per month, total outgoings = 25% of gross rent, estimated future life = 35yrs, area of land = 200 m^2, estimated value of Land = Rs 2000 per square meter. Determine the fare value of property. Take rate of interest on capital as 10% and rate of redemption of capital as 5%. Assume suitable data, if required.   [1+6]

8. Write short notes on: (Any two)   [2×4]

   a) Pre-bid meeting
   b) Methods of valuation of properties
   c) Material handling system
   d) BOOT

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Subject: - Computational Techniques in Civil Engineering *(CE751)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt *All* questions.
✓ The figures in the margin indicate *Full Marks*.
✓ *Candidate should use separate answer book for each group (Water and Structure).*
✓ Assume suitable data if necessary.

Group A
(Water)

1. Explain the concept of finite difference method. What do you mean explicit and implicit scheme in finite difference method? For the grids given below discretize using explicit and implicit scheme using forward, backward and central difference approach for space and time derivatives. [2+2+2]
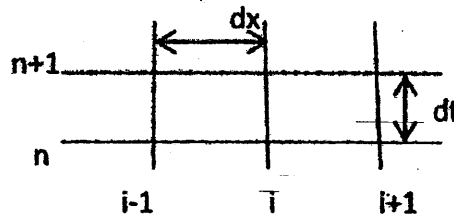

2. A river which is generalized as trapezoidal channel is 300m wide with side slope 5:1, has bed slope 1% and Manning's n 0.04. Initially discharge through the river is 100 m^3/s. Due to a flood the discharge observed at the upstream section of the river is 300m^3/s, compute discharge at 2650m downstream from upstream section. Take $\Delta x = 2650$m and $\Delta t = 1$ hr. Use linear kinematic wave solution. [6]

3. The following is the characteristic form of equation for one dimensional unsteady pipe flow:

$$\frac{dV}{dt} \pm \frac{1}{\rho c}\frac{dP}{dt} + gSin\theta + \frac{fV|V|}{2D} = 0$$ where V = Average velocity over a section, ρ = density of fluid, P = pressure at a point, c = celerity of wave, g = acceleration due to gravity, Sinθ = slope of pipe, f = friction factor, D = diameter of pipe. Develop finite difference equations for above equations using the concept of method of characteristics (MOC). Also, explain the criteria for the stability of the MOC solution. [6+2]

4. The figure shows a 2 dimensional grid with the values of potential function (ϕ) for simulating seepage. Calculate vertical and horizontal seepage into and out of grid A i.e. Q_A, Q_B, Q_C and Q_D. Transmissivity in x-direction and y-direction are 2200 m^2/day and 2400 m^2/day respectively, for all grids; $\Delta X = 80$m and $\Delta Y = 90$m. [8]

0	0	0	0
2.3	2.2	2.1	2.08
2.27	2.23	2.06 Grid A	2.01
2.22	2.12	2.03	2
0	0	0	0

Group B
(Structure)

5. Describe briefly the different solution techniques used for numerical computations of civil engineering problems. Also mention their merits and demerits. [8]

6. What do you mean by Banded Matrix and how do you optimize the memory? Write the algorithm for Conjugate Gradient Method. [4+4]

7. a) Differentiate the plain stress and plain strain problem with suitable example. [4]

   b) Derive the equilibrium equations for solid element and also define the axisymmetric problems. [6]

8. Determine the nodal displacements and reaction forces of the beam loaded as shown in figure below. Give that, L1 = L2 = 3 m, P = 15 KN, MO = 40 KN-m, E1 = E2 = 2×10^5 MPa, I_1 = I_2 = 5×10^6 mm^4. [10]
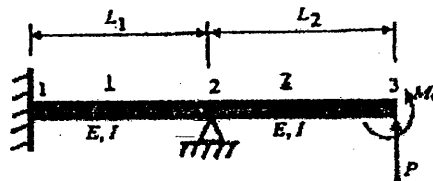
9. Derive the shape functions Ni for the six-noded triangular 2D element shown in the figure below. [6]
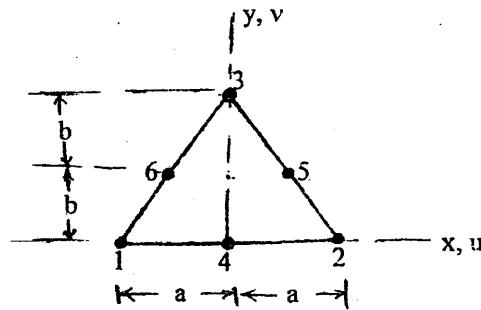
10. A steel plate of thickness 8 mm is being loaded as shown in the figure below. Considering the plane stress condition, determine the nodal displacements and stresses of the CST element. Take E = 210 × 10^3 MPa, G = 105 × 10^3 MPa, and unit weight of the steel is 78.5 KN/m^3. [10]

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