Exam.		**Back**	
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Irrigation and Drainage Engineering *(CE654)*

✓ 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) Explain GCA, CCA, NCA, Cropping Intensity and Cropping Pattern.   [5]

    b) Write down the steps for calculating irrigation requirement for Rice crop.   [4]

    c) The field capacity of soil is 40%, Permanent wilting point is 20%, Density of soil is
        1.2gm/cc, effective root depth is 90cm, ET crop is 10mm/day. Calculate the irrigation
        interval (IR) if the readily available moisture (RAM) is 75% of available soil moisture
        capacity and show AMC, RAM and irrigation interval on graph of Available moisture
        and time.   [5+2]

2. a) Write down the concept of Kennedy and Lacey's Silt Theory.   [8]

    b) Proof using Lacey's Theory that $P = 4.75 (Q)^{0.5}$ [4]

    c) Design a canal using Lacey's Theory carrying a discharge of 20 cumec, silt factor =
        1.5 and side slope is 0.5:1(H:V)   [4]

3. a) Write down the cause and effects of water logging. Also explain method of
        reclamation of water logged area.   [6]

    b) Derive the expression for subsurface drainage spacing.   [5]

    c) Explain different types of outlets used in irrigation projects.   [5]

4. a) Neatly sketch a guide bund and design the following components of a guide bund for
        a river discharge of 4000 m³/s and silt factor 1.1.   [8]
        (i) length of guide bund
        (ii) thickness of pitching
        (iii)width of launching apron
        (iv)depth of launching apron

    b) Explain different level of planning in irrigation projects, also explain different types
        of maintenance in irrigation projects.   [8]

5. Write short notes: [4×4]

    a) Irrigation Development in Nepal
    b) Types of Irrigation Method
    c) Different types of cross Drainage works
    d) Different types of Fall structures

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06   TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Baisakh

Exam.		**Back**	
Level	BE	**Full Marks**	80
Programme	BCE	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Sanitary Engineering *(CE656)*

✓ 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. Describe the methods used in the management of wastewater and solid waste producing from a locality. [5]

2. Describe the method of estimating quantity of sewage for a city in Nepal in detail. [6]

3. Determine the size of combined circular sewer for a discharge of 1.5 m³/s running half full. Assume a gradient of 1 in 2000 and Manning's rugosity coefficient N = 0.013 (Constant for all Flows). In the dry season if the flow drops to 0.50 m³/sec, does the flow maintain desired self cleaning velocity of 0.60m/sec. [8]

4. Define manhole. Explain the construction of manhole with the help of neat sketch. [1+4]

5. 5 ml of a sewage sample taken under the Thapathali bridge of Bagmati river was pipetted into a 300 ml capacity BOD bottle which was then completely filled with dilution water. The DO concentration of this mixture is tested and found to be 9.2 mg/l. Now it is kept in the incubator maintained at 25°C for a period of 7 days. The DO concentration after incubation is found to be 5.3 mg/l. Adopting base 10 value of K as 0.1/d, determine the 4 day BOD of sewage at 30°C in Bagmati river at that particular location. [8]

6. A city discharges sewage at the rate of 1200 l/s, into a stream whose minimum flow is 5000 liters/sec, the temperature of both being 20°C. The 5 day BOD at 20°C for sewage is 160mg/l and that of river water is 2mg/l. The DO Content of sewage is zero while that of stream is 90% of the saturation DO. Find out the degree of treatment required if the minimum DO to be maintained in the stream is 4 mg/lit. Assume deoxygenation coefficient as 0.10 (base 10) and re-oxygenation coefficient as 0.30 (base 10). Given saturation DO at 20°C as 9.17 mg/lit. [8]

7. What is a grit chamber? Why do a sewage treatment plant need grit chamber? Enlist the considerations adopted in the design of grit chamber. [1+2+5]

8. Determine the size a high rate trickling filter for the following data: [10]

   Sewage flow = 5 Mld
   BOD of raw sewage = 250 mg/l
   BOD removal in primary clarifier = 30%
   Final effluent BOD desired = 30 mg/l

9. Design a sludge digestion tank to treat sludge of primary sedimentation tank from the following data: [8]

   a) Average flow of the sewage = 6.5 MLD
   b) Total suspended solids in raw sewage = 250 mg/l
   c) Water content of fresh sludge = 95%
   d) Water content of digested sludge = 85%
   e) Specific gravity of sludge = 1.02
   f) Digestion period = 2 months
   g) Primary settling tank removes 55% of suspended solids

10. Design VIP latrine and septic tank for a family of 10 users. The detention time for septic tank is 24 hr. Sludge is cleaned in every three years. [8]

11. Explain sanitary land filling method for disposal of solid _____

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

Subject: - Sanitary Engineering (CE656)

✓ 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. Describe the methods used in the management of wastewater and solid waste producing from a locality. [5]

2. Describe the method of estimating quantity of sewage for a city in Nepal in detail. [6]

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6. A city discharges sewage at the rate of 1200 l/s, into a stream whose minimum flow is 5000 liters/sec, the temperature of both being 20°C. The 5 day BOD at 20°C for sewage is 160mg/l and that of river water is 2mg/l. The DO Content of sewage is zero while that of stream is 90% of the saturation DO. Find out the degree of treatment required if the minimum DO to be maintained in the stream is 4 mg/lit. Assume deoxygenation coefficient as 0.10 (base 10) and re-oxygenation coefficient as 0.30 (base 10). Given saturation DO at 20°C as 9.17 mg/lit. [8]

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   b) Total suspended solids in raw sewage = 250 mg/l
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   d) Water content of digested sludge = 85%
   e) Specific gravity of sludge = 1.02
   f) Digestion period = 2 months
   g) Primary settling tank removes 55% of suspended solids

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11. Explain sanitary land filling method for disposal of solid waste

8

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE, BGE, BME, BIE	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Communication English (SH651)

✓ 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. Edit the text given below: [5]
   If you do not acknowledge weakness on the face of troubles and if you refuse to worry about your problems, you will find on how much more successful, peaceful, and happy you are. Daily make this affirmation. I will be neither lazy nor feverishly active in every challenge of life I shall do my best without worry about the future.

2. Read the following text carefully and interpret it so as to make the meaning clear: [5]
   The planet on which man lives is the third closest to the sun, with the third shortest orbit. It also has something none of the others has- an atmosphere that can support life in all the manifold forms that exist on our planet. There may be satellites circling other stars in other parts of the universe, which have the right ingredients for some sort of life to evolve, but the earth is the only one in the solar system.

3. Study the following text carefully. Prepare its note and then write a summary.   [5+5]
   Men have never succeeded in keeping free from war in the past. Nor are they likely to do so in the future, as long as they are organized in separate nation states, each of which is in control of its own army, navy and air force and each of which is, therefore, to control the government believes, however, wrongly that he can obtain an advantage for himself and his country. Only some form of world government, which controls all the world's armed forces and against which no single nation or group of nations could wage war since they would not have the wherewithal to do so, can finally save the world from war.
   Secondly, science, by accelerating man's speed of movement, has made the world a single whole. Hence any war which breaks out anywhere will destroy the whole of civilization and not merely the part affected by the war, as has been the case in the past. That is why the new powers conferred upon man by science increasingly demand a world government if they are not to result in man's destruction.

4. Answer any two of the following: [5+5]
   a. Can the problem be solved by killing the leader of any terrorist group? Justify your answer with reference to the text Mother of a Traitor. (The Mother of a Traitor)
   b. Is love always limited to husband and wife? Answer with reference to the text 'The Lady with the Pet Dog'.
   c. What is chain reaction and how does it support the Einstein's theory? (Chain Reaction)

5. Choose the correct words from the brackets: [0.5x10=5]
   a. Two third of our workers ....in the suburbs. (live/lives)
   b. The number of board members ....very small. (is/are)
   c. The chief competitor, as well as ourselves......prices this summer. (are obliged to raise/is obliged to raise)
   d. We met him immediately after the session in which he .... a nice speech. (had been given/had given)
   e. If neither of them ....it is not at all advisable to invest further. (is to be trusted/are to be trusted)

f. Don't touch that door as it ....(had just been painted/has just been painted)

g. The district collector .... the prizes to the winners at the end of the function. (gave up/ gave away)

h. .... realized the nature of the job earlier, I would not have accepted it. (if I would have/ had I)

i. The passive of "Your honesty has pleased me." Is......... (I have been pleased with your honesty. / I have been pleased by your honesty.)

j. The passive of "But, I will meet her." Is ..... (But, she will be met by me. / It is reasoned that she will meet me.)

6. Compose the following bibliographic references into MLA and APA. [4]
   a. Berlin:/Oldham publishers/2012/Muller, G./Cardio graphic analysis and diagnosis techniques/
   b. Pathak, R. /2010 / Mumbai:/Fortune publishers/Biomedical CFD/

7. Inventing necessary details, write a notice with four point agenda for the forthcoming sixth meeting of your organization. [5]

8. Suppose you are the chief consultant of Kulekhani hydropower maintenance project. Write a progress report in memo format. [6]

9. Assume that you are asked to prepare a final report of Tribhuvan Highway expansion project that you have handled. Write introduction, objectives, methodology, and conclusion parts of your report. [10]

10. Assume that you are requested to write a proposal on Reserve Water Tank in Mahalaxmi Municipality. Write the title page, abstract, statement of problem and cost management parts of your proposal. [10]

11. Write a short research article in about 500 words on the "Efficiency in English for Technical Writing and Presentation." [10]

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

Subject: - Building Technology *(CE652)*

✓ 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) Explain moisture movement through Building Component. Describe the methods to stop moisture entering to a building? [8]

   b) What do you mean by thermal comfort for the building purpose? Explain its classification with appropriate examples. [8]

   OR

   Illustrate the requirements of lighting in the building. What are the principle for the site selection and planning?

2. a) Describe the factor affecting the design of foundation. How can we improve the bearing capacity of soil? [8]

   b) What kind of member is queen post truss? Draw a queen post truss explaining their element's function. [8]

   __   **OR**

   Define the terms scaffolding, underpinning and shoring. Explain the methods to carry out underpinning work.

3. a) Explain the general parts and terms used in door and window with necessary diagram. Define casement, awning and hopper window. [8]

   b) Design a suitable staircase for public building in a hall of size 5.50 m * 7.50 m. The vertical clear distance between floor is 3.5 m and the RCC slab thickness in 150 mm. (assume any necessary criteria, if required). [8]

4. a) How earthquake protection can be achieved for a load bearing masonry building? What are the factors to be considered for improving Building for seismic safety? [8]

   b) What are the various techniques of retrofitting? Why retrofitting in existing building is important? [8]

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

   a) Form works
   b) Causes of cracks in Building
   c) Cladding materials for wall
   d) Ran water harvesting
   e) Floor and wall tiles
   f) Mortars used in plastering wones

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

Subject: - Building Technology *(CE652)*

✓ 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. Define principles of orientation and planning of a building briefly. What are the main factors to be considered for best orientation of building? [7+3]

2. What is damp proofing? Describe general methods of damp proofing. [2+6]

3. Define foundation. What are the basic requirement of foundation? Explain different types of shallow foundation with necessary sketches. [1+3+6]

4. Define mortars. Find out the quantities of cement and sand for 100 m2 plastering area in 1:6 ratio if the thickness of plaster is 12mm. [2+6]

5. What do you mean by rainwater harvesting? Describe the fundamental requirements of Electrical wiring. [3+3]

6. Define single/double/multiple timber roofs. Draw neat sketch of king post truss labeling with corresponding elements. [3+5]

7. Define stair. Design a quarter turn staircase for a residential building in a lobby of size 5.5m * 4.0 m. The height of floor to floor is 3.0 m. Assume necessary data if required. Draw neat plan to justify your design. [1+6+1]

8. Explain shoring, list out its types. Describe flying shoring with necessary sketches. [1+3+4]

9. How do you define retrofitting? Explain RCC and steel jacketing with neat sketches. [2+6]

10. Write short notes on: (any two) [2×3]

    a) Construction method of terrazzo flooring
    b) Differentiate between plastering and pointing
    c) Retaining wall

***

2

Subject: - Transportation Engineering (CE653)

✓ 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. Explain the relevancy of road transportation in the context of Nepal.

2. Explain the engineering surveys to be carried out for a highway alignment.

3. What are the importance of highway geometric design? Critically discuss various factors that affect geometric design of road.

4. Define super elevation. Explain the methods of introducing super elevation with neat sketches.

5. Calculate the minimum sight distance required to avoid a head-on collision of vehicles approaching form the opposite directions speed at 60 kmph. Use the total perception reaction time of 2.5 seconds, coefficient of friction 0.40 and brake efficiency of 50%. The section of the road under consideration has a grade of 10%.

6. A vertical curve connects a - 3.0% grade with + 4.5% grade on a rural highway at station 6+525 and elevation 411.6m. The curve should be designed at least to provide the visibility of the road surface to a distance of 250 m at night time. Locate the starting, lowest, and end point of vertical curve. Calculate the elevation of road at all these points along the curve and at a distance of 50m left and right from the point of vertical intersection. Assume the head light beam angle and heights of the head light from the road surface for the design vehicle are 2° and 0.6m respectively.

7. Define cross-drainage structure. Explain it types with neat sketches.

8. What are various problems in hill road construction? List out different characteristics for ridge route and river route location.

9. Explain the desirable properties of aggregate to be used in different types of pavement construction.

10. What are the different types of bitumen? Write down the laboratory procedure of ductility test of bitumen.

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3

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

Subject: - Transportation Engineering *(CE653)*

✓ 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. Write down the scope of highway engineering. What are the characteristics of road transport in comparison with other modes of transportation?

2. Enlist the requirements of highway alignment. Write the process of detailed engineering survey of highway alignment.

3. Define stopping sight distance. Explain the factors affecting stopping sight distance. Derive the expression for stopping sight distance.

4. A horizontal curve of 625 m radius is to be set out to connect two straight of a national highway. The speed of the vehicle is restricted to 90 Kmph. Calculate

   a) length of transition curve
   b) the chainage of beginning and end of the curve given that,
      angle of intersection = 130°24'
      rate of change of contrifugal acceleration = 0.25 m/s^3
   c) chainage of point of intersection = 1092.500m

5. Design the total length of the valley curve at the junction of the descending gradient of 1 in 40 and an ascending gradient of 1 in 30 if the design speed is 100 kmph. So as to fulfill both comfort condition and head light sight distance for night driving. Locate the lowest point and the end of curve point too. Calculate their elevations if the elevation of the beginning of the curve is 312.56m above sea level. Assume other necessary data reasonably.

6. Explain the different types of gradient and factors to be considered in its selection.

7. Explain how the surface water is collected and disposed-off in rural and urban roads. What are the special problems in drainage of surface water in hill roads?

8. Explain the special considerations and challenges of hill road construction?

9. Explain the desirable properties of sub-grade soil? Also explain the impact test of aggregate.

10. Define bitumen premixes. Explain the laboratory test procedure of Marshall stability along with its significance.

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06   TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Bhadra

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

Subject: - Sanitary Engineering *(CE656)*

✓ 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. What do you mean by sanitation? How it is related with our human life? Why water-carriage system of sanitation is popular than conservancy system nowadays. [4]

2. As a sanitation engineer how would you determine the quantity of storm water for a highly populated urban area? What type of limitations exists in storm water quantity determination for such area? Discuss in detail. [4]

3. What would be your preferable combined sewer section for an 85-hectare residential area having average runoff coefficient of 0.45 for serving altogether 1500 population? average rainfall duration is 26-min. Self-cleansing velocity is 0.98 m/sec. residential·area have average elevation difference of 22m in horizontal 5 km longitudinal distance. Assume any other appropriate data if required. [8]

4. Briefly describe drop-manhole with neat sketch mentioning its importance and discuss its alternative structural option with applicability. [4]

5. $BOD_{1,22°C}$ of a sewage sample is 310 mg/l. What will be its $BOD_{5,30°C}$? Assume reaction rate $K_{20} = 0.12$ per day. [8]

6. You are assigned by an industry as a Sanitary Engineer to recommend the degree of treatment required for their industrial waste water. The effluent from the treatment plant is to be discharged into a river with a minimum flow of 5000 lps, a dissolved oxygen content of 7.4mg/l and BOD of zero. In order to thrive aquatic life, it is necessary to maintain a minimum DO content of 4mg/l in the river. A sanitary reveals the characteristics of industrial waste water as follows: [8]

   Discharge = $2*10^6$ l/day
   BOD = 5000 mg/l
   DO = 0

   Recommend the degree of treatment required for the plant. Assume saturation DO of 9.2 mg/l in the river after mixing with wastewater. It is equal to DO content of river before mixing. Assume any other appropriate data if required.

7. a) With neat sketches, describe the purpose and construction of a skimming tank. [4]

   b) If the effluent BOD is to be equal to or less than 35 mg/l, what will be the recirculation ratio required of a single high rate trickling filter having volume of 510 m^3 which receives a flow of 2.8 MLD. The raw sewage has BOD of 210 mg/l. The primary treatment removes 20% BOD. [8]

c) What will be the suitable dimensions of a circular sewage sedimentation tank for an industrial area having population of 5500? The average water demand is 180 lpcd. Assume that 75% water reaches the treatment plant and maximum demand is 2.4 times average demand. Dimension of the suspended silica particles available in influent water are larger than 0.14 mm. [8]

d) What are the advantages in using the dorrco aerator in activated sludge process method; briefly describe its operation with neat sketch. [4]

8. The biological process occurs in trickling filter. PST removes 60% suspended solids and 30% of BOD. Determine the volume of sludge produced by PST as well as SST with the following data. [8]

Sp. gr. of inorganic solids = 2.65,   Sp. gr. of organic solid = 1.02
Flow of sewage   = 20*10^6 l/d BOD_5 of sewage   = 220 mg/l
Suspended solids in the sewage= 280mg/l   Water content of the sludge = 95%

9. What would be the internal dimension of a septic tank and numbers of soak pits for an isolated hotel situated at mid-southern zone of Nepal having average 80 numbers of average users? Rate of sewage discharge is 210 lpcd. Cleaning period of septic tank is 3 years. Assume other necessary data if required. [8]

10. Discuss about the solid waste composting and its methods? [4]

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6

04   TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Bhadra

Exam.		Regular	
Level	BE	Full Marks	80
Programme	BCE, BEl, EX, BCT, BGf	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics (CE6)

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

1. Define term Engineering economy. Explain principles of engine ng economy.   [1+3]

2. a) If you make equal monthly deposits of Rs. 5000 into the k for 10 years, saving accounts that pays interest rate of 6% compounded mc y. what would be the amount at the end of 15 years?   [4]

   b) How much rupees should you deposit now so that you will ble to draw Rs.5000 at the end of this month which increases by 2 percent per ith for 15 years. Bank interest rate is 5% per year.   [4]

3. a) Explain any two drawbacks of IRR with example. Differ ite between Economic analysis and financial analysis.   [3+3]

   b) Evaluate the project by using AW formulation of the proje i = 12%.   [4]

EOY	0	1	2	3	4	
Cash flow	-3000	800	1000	1100	1210	64

   c) Calculate the ERR of the following cash flow. MARR = %, reinvestment rate = 14%.   [6]

EOY	0	1	2	3	4	
Cash flow	-100,000	25,000	40,000	-10,000	50,000	,000

4. a) Choose the best project among these alternatives using l if MARR = 15% and study period is 10 years. Salvage value is 20%.   [6]

Project	A	B	C	
First Cost Rs.	900	1500	2500	)
Annual Revenue Rs.	150	276	400	

   b) Consider the following two mutually exclusive alterna: recommend the best alternatives using repeatability assumptions. MARR = 15   [16]

	Project X (Rs.)	Project B)
Initial Cost	100,000	150,000
Annual Cost	25,000	12,000
Salvage Value	40000	50000
Useful Life	6 years	10 years

5. Define defender and challenger and Explain economic service life. Company X is going to purchase a router having initial cost Rs.18,000 having salvage value of Rs.12000 at the end of first year and decreases by 20% each year then after for remaining useful life. Annual operation and maintenance cost is Rs. 5000 in first year and increases by Rs.2000 each year. Its useful life is 6 years. Calculate economic service life of the router. [2+2+8]

6. a) A project costs Rs. 125,000 with annual revenue of Rs.65,000 and annual cost of Rs.35,000. Salvage value will be 8% of the initial investment. Perform Sensitivity analysis using PW formulation over a range of ±40% in i) Initial Investment ii) Annual Revenue iii) Useful Life and iv) MARR. Draw the sensitivity diagram and indicate the most sensitive and least sensitive parameters. [6+2]

   b) Define breakeven point and breakeven volume. How does interest rate change affect the project? [2+2]

7. a) Compute the annual depreciation allowances and the resulting book value using the double declining balance method with Switch over to straight line method.
   Cost of asset = Rs. 100,000, Useful life = 5 years, Salvage Value = 20000 [6]

   b) A company bought a machine at Rs 25000 which is expected to produce benefit of Rs 8000 per year for five years. Its salvage value at the end of five years is Rs 10000. Calculate after tax cashflow if Tax rate is 40% and depreciation is on Sinking fund method. I = 20% [6]

8. Define inflation. Calculate IRR if MARR = 12% and inflation rate is 8%. [1+3]

Year	0	1	2	3	4
Constant Dollar	-6000	1500	2000	2500	3000

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12

07   TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Bhadra

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

Subject: - Irrigation and Drainage Engineering *(CE654)*

✓ 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. Why is irrigation development important for Nepal? Define cropping pattern and cropping intensity. [3+2]

2. a) If daily consumptive use of the crop is 5 mm and the canal may operates from 6 AM to 5 PM only. Available moisture for the given soil is 220 mm per m and maximum depth of root zone for the crop is 1.2 m. Assume that only 50% of soil moisture is available to the crop. Application efficiency is 65%. Calculate the required discharge if CCA is 450 ha. Calculate Irrigation interval and outlet discharge. [6]

   b) Define irrigation water requirement for rice crop. [2]

3. a) With a neat sketch, explain the canal distribution system suitable in Terai region of Nepal. [2]

   b) A canal has bed width of 8m. Full supply depth of water is 1.5m, side slope in cutting 1:1 and filling 1.5:1. Top width of the bank is 1.8m and service bank is 5.0 m. Free board is kept 0.6m. Calculate balancing depth so as to get the most economical section. [4]

4. a) Describe briefly the semi theoretical approach in canal design. [3]

   b) Design an economical trapezoidal lined channel to carry a discharge of 20 cumecs at a slope of 30 cm/km. The side slope of the channel is 1.5:1. The value of Manning's rugosity coefficient is 0.017 and limiting velocity in the channel is 1.5 m/s. [6]

5. a) What are the ways of controlling entry of sediments into canal from headworks? Differentiate between silt ejector and silt excluder in irrigation system. [4]

   b) A canal carrying 150 m^3/s is to take off from the headwork. The HFL and average bed level of river is 257m and 250m respectively. The canal bed level, full supply level and pond level are 249.5m, 253.0m and 254.0m respectively and Lacey's silt factor is equal to unity. Fix the crest level and water way of canal head regulator and also determine the length of impervious floor if safe exit gradient $G_E = 1/6$. Draw the conceptual sketch of canal head regulator. [8]

6. a) Why river training works are required? Explain with neat sketch, the layout of spurs to train the river in bend. [3]

   b) A bridge is to be constructed across a river having the following hydraulic data:

   Maximum flood Discharge : 5000 m^3/s
   Highest flood level : 254.0 m
   River bed level : 250 m
   Average diameter of river sand : 0.25m
   Design and sketch a guide bank including launching apron to train the river. [5]

7. a) Describe briefly the different types of canal outlet. What is flexibility of outlet? [2+2]

   b) Write the stepwise design procedure of cross regulator and distributary head regulator with supporting sketches. [8]

8. Design a Siphon aqueduct with the data given below:

   Full supply discharge of canal = 30m³/s
   Bed width of canal = 24 m
   Full supply depth = 1.25 m
   Side slope of canal section = 1 ½ : 1 (H:V)
   Bed level of the canal = 100.00 m
   Max. flood discharge of drain = 500 m³/s
   High flood level = 100.50
   Bed level of drainage = 98.00 m
   Normal ground level = 100.00 m
   Lacey's silt factor = 1.0
   Rogosity coefficient (w) = 0.016
   Make suitable assumptions where necessary. [10]

9. a) Write down the effects and preventive measures of water logging. [4]

   b) Determine the drainage rate required to meet the following condition. Maximum yearly precipitation for three consecutive days = 300mm. The design rainfall is to be taken as 10 year return periods. Initial water level in field = 40mm. Maximum water level is 300mm, which may persist for up to one day and depth in excess of 200 mm may persist for up to 3 days. Take growth factor to one day and depth in excess of 200 mm may persist for up to 3 days. Take growth factor for 10 year return period as 1.5. Assume other suitable data if necessary. [6]

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16

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, BGE	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics (CE655)

✓ 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. Define Engineering Economics. Write down the principles of Engineering Economic Analysis. [4]

2. What is nominal and effective interest rate? Evaluate FW at the end of 10 years with 12% interest rate compounded monthly of a cash flow of Rs. 40,000 at the beginning of each year for 5 years. [2+4]

3. a) Use IRR method to evaluate following project when MARR is 15%. Make also unrecovered balance graph. [5]

EOY	0	1	2	3	4	5
Cash flow	-60,000	20,000	40,000	-40,000	50,000	70,000

   b) Your college is considering to purchase a vehicle of Rs. 3,00,000 expecting salvage value Rs 50,000 at the end of 10th year. The use of vehicle saves Rs. 80,000 per year. When it needs Rs. 20,000 operating cost for each year. Find: (i) Both type of B/C ratio by FW formulation (ii) both types of payback period. [4+4]

   c) Distinguish between financial and economic analysis. [2]

4. a) Compare the following two mutually exclusive projects by using (i) Co-terminated (ii) Repeatability assumption taking MARR = 8% [4+4]

	Project A	Project B
Initial cost	1,50,000	2,00,000
Annual revenue	90,000	1,00,000
Operating cost	20,000	20,000
Life year	4	6
Salvage value	80,000	1,20,000

   b) Define mutually exclusive, contingent and independent projects with suitable example. [3]

5. What are the procedure for replacement analysis when planning horizon is infinite? [4+8]

   Find economic service life from the following information.

   Initial cost = Rs 50,000

   Operation cost = Rs 10,000 for the 1st year and increases by 15% thereafter

   Salvage value = Decline each successive year by 20% over previous year.

   Useful life = 8 years

   MARR = 15%

6. Explain about the decision tree analysis. Perform sensitivity analysis of the following project over range of ±30% at an interval of ±10% in (i) Initial Investment (ii) Net Annual Revenue and (iii) Useful life. Use PW formulation. [2+10]

Initial Investment (Rs)	1,00,000
Net Annual Revenue (Rs)	40,000
Salvage Value (Rs)	15,000
Useful life (years)	6
MARR (%)	10

7. Write down the causes for depreciation of assets. If a machine costing of Rs. 1,00,000 is purchased by expecting salvage value of Rs 20,000 at the end of 6th years. Calculate the depreciation amount for each years by SOYD and straight line method. [2+5+5]

8. Define constant dollar and actual dollar amount. Suppose you borrowed Rs.1,20,000 from a bank to buy a bike and you have promised to pay Rs.6000 per month for two years. What is the inflation free interest rate you are supposed to pay if average inflation rate is 0.75% per month. [4+4]

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

Subject: - Building Technology (CE652)

✓ 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. a) Explain various types of moisture movements in different components of building structures.

   b) What do you understand by orientation of building? Discuss the factors to be considered for the best orientation of a building.

2. a) Explain different types of shallow foundation with neat sketches.

   b) Explain various types of stone masonry. Draw typical sketches to illustrate them.

3. a) With the help of neat sketches, list and explain the terms used in pitched roof.

   b) Design a dog legged RCC stair for a residential building with a staircase of internal dimension of 4.6 m×2.6 m and 3.0 m floor to floor height. Draw both plan and section to justify your design.

4. a) Give a list of materials which are commonly used as floorings and give a brief description of each.

   OR

   Discuss purpose and sizing of doors and windows. List different terms used in panelled doors.

   b) Define shoring with the help of neat sketches. Explain single flying shore.

   OR

   Explain methods of pointing and types of pointing.

5. a) How do you define retrofitting of building structure? Explain conventional jacketing with necessary sketches.

   b) Explain rainwater harvesting, write down process of treatment.

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

Subject: - Transportation Engineering (CE653)

✓ 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. Discuss the classification of roads as per Nepal road standard (NRS 2070). Why road transportation is considered the most feasible in Nepal?   [8]

2. Describe the requirements and factors affecting the highway alignment.   [8]

3. Discuss about PIEV theory with example. Define Stopping Sight distance and enumerate the various factors affecting the stopping sight distance.   [3+5]

4. The angle of intersection between two straights is 145.37°. The spiral angle for each transition curve is 10.32°. Calculate the length of transition curve, combined length of curve and the length of tangent if the radius of the curve is 350 m.   [8]

5. Define superelevation. Derive an expression for superelevation.

6. An ascending gradient of 2.75% meets with descending gradient of 2.25%. The radius of curve is 5000 m. If the reduced level of the curve at a distance of 60 m from BVC is 312.12 m, find the reduced level of BVC, EVC and highest point of the curve.   [8]

7. Describe the causes of moisture variation in subsurface soil. Explain with neat sketches how the sub surface drainage is provided to lower the water table and control of seepage flow.   [1+3+4]

8. Explain briefly the special consideration to be taken in hill road design. Draw neat sketches of different types of cross section of hill road.   [8]

9. What are the desirable properties of road aggregates? Explain the crushing value test of aggregate?   [4+4]

10. Describe the procedure of Marshall Stability test in laboratory.   [8]

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

Subject: - Irrigation and Drainage Engineering

✓ 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__.
✓ Necessary figures are attached herewith.
✓ Assume suitable data if necessary.

1. Explain the importance of irrigation development in Nepal. What are the problems and challenges of irrigation development in Nepal? [4]

2. A stream of 150 liter per second was diverted from canal and 110 liter per second was delivered to the field. An area of 2.2 hectares was irrigated in 8 hrs. Effective depth of root zone was 1.5 m. The runoff loss in the field was 445 m3. The depth of water penetration varied linearly from 1.5 m at the head end of the field to 1.1 m at the tail end. Available moisture holding capacity of the soil is 200 mm per meter depth of soil. Determine the water conveyance efficiency, water application efficiency, water storage efficiency and water distribution efficiency. Irrigation was started at a moisture extraction level of 50%. [8]

3. Describe in what way you can align an irrigation canal for an agricultural land? Also write about canal standards and balancing depth. [3+2]

4. a) A canal is to be designed to carry a discharge of 40cumecs. The bed slope is kept 1 in 1200. The soil is course alluvium having a grain size of 5 cm. Assuming the canal is trapezoidal and to be unlined with unprotected banks. Determine a suitable section for the canal. Assume φ 37° [4]

   b) The slope of a channel in alluvium is 1/4000, Lacey's silt factor is 0.9 and side slopes are 0.5:1 (H:V). Find the channel section and maximum discharge which can be allowed to flow in it. [6]

5. a) A river carries a high flood discharge of 16000 m³/s with its average bed level at 200.0 m. A canal carrying 200 m³/s is to take off from the headworks. The full supply level of the canal at its head is 203.0 m. The high flood level before construction is 205.7 m and Lacey's silt factor is equal to unity. Fix suitable values for the waterway and crest levels of weir, undersluices and canal head regulator. Assume suitably any other data if required. [6]

   b) Calculate the uplift pressure at key points of the pile of the structure shown in figure below. Draw HGL and also check the thickness provided and safe exit gradient GE = 1/5. [8]
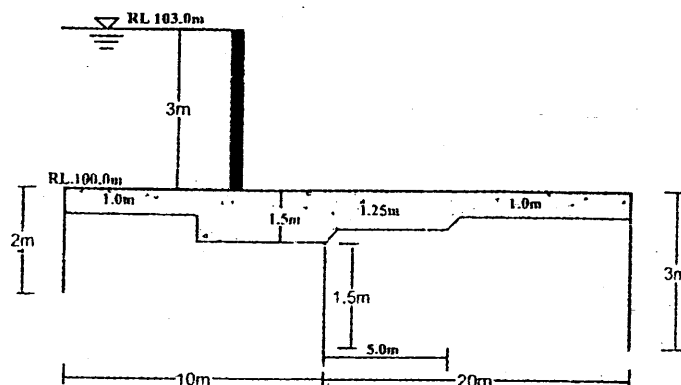
6. Explain with sketch four different methods of river training works. [2×4]

7. a) Why drop structures are required in canal irrigation system? Explain the types of drop structures with neat sketches. [2+2]

   b) Design a crest width, cistern length and its level of a vertical drop structure for the data given below. [8]

   Full supply discharge u/s and d/s = 1.55 cumecs

   Drop height = 0.75 m

   FSL u/s and d/s = 105.997 and 105.247

   Full supply depth u/s and d/s = 0.929 m

   Bed levels u/s and d/s = 105.068 and 104.318

   Bed width u/s and d/s = 1.1 m

   Top width of crest = 0.5 m for initial assumption C_d = 0.415 for rectangular crest. The drop structure is of masonry with specific gravity 2.0 side slope of the canal is 1:1. The Bligh's coefficient as 7.0 for sandy loam soil at foundation.

8. Following data are obtained at the crossing of a canal and drainage. [10]

   Canal Data

   Discharge: 25cumec, Full supply depth: 2.0 m, Bed width: 30m, Bed level: 210.3 m, Side slope: 1.5H:1V

   Drainage Data:

   Discharge: 360 cumec, HFL: 211.0 m, Bed level: 208.5 m, General ground level: 210.5 m

   Design the drainage waterway, canal waterway and find the bed levels and FSL at four different sections of the canal Trough.

9. a) What are the preventive measures of water logging of agricultural land? [3]

   b) How many days the field will be innundated above 200 mm depth if a drainage rate of 3 l/s per ha is maintained by constructing internal drainage system? Will such system cause the depth to exceed 300 mm? [4+2]

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06   TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

Examination Control Division

2073 Bhadra

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

Subject: - Sanitary Engineering *(CE656)*

✓ 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. Why scientific management is necessary for wastewater and solid waste produced in community? Enlist the objectives of the sewage disposal. [1+3]

2. What are various factors affecting the discharge of sanitary sewage? How do you calculate sanitary sewage discharge? [4]

3. What will be the diameter of a circular concrete sewer carrying $2/3^{rd}$ depth at the peak discharge of 0.70 m³/s laid in a gradient of 1 in 1000? Also check whether it is safe for non-scouring velocity or not. Assume Manning's 'n' as 0.012. [8]

4. Explain the necessity of providing manhole in sewer line with a neat sketch. [4]

5. How do you determine the Total Solid, Total Volatile Solid, Total Fixed Solid, Settable Solid and Non-settable Solids contained in a sewage sample? [8]

6. A city is discharging sewage of 100 *l*/s in the river having discharge of 1000 *l*/s and a velocity of 60 km/day. The BOD_5 of sewage and river water are 450 mg/l and 4mg/L respectively. The DO of sewage is zero. The DO in river is 70% of saturation DO value. And, the saturation DO at 20°C is 9.17mg/l. Take deoxygenation constance (K_1) = 0.1/day (base 10) and reaeration constant (k_2) = 0.5/day (base 10). Calculate the value of critical DO deficit. [8]

7. a) Propose the dimensions of grit chamber for a sewage treatment plant with 50 MLD of sewage flow at 25°C to remove 0.2 mm size of grit having specific gravity of 2.65. The Specific gravity of organic matter is 1.02. Assume k = 0.06 and f = 0.03. [8]

   b) Design a conventional activated sludge treatment plant to treat the domestic sewage with diffused air aeration with the following data. (Design up to dimensions of aeration tank only) [8]

    Population = 1,00,000
    Per capita sewage flow = 96 liters/day
    Settled sewage BOD_5 = 200 mg/L
    Food/micro-organisms = 0.3
    Concentration of microorganism (MLSS) = 2000 mg/L

   c) What is an oxidation Pond? Explain the theory of oxidation pond with a neat sketch. Explain its commissioning methods. [1+3+4]

8. A raw sewage having suspended solids content of 220 mg/lit is passed through primary sedimentation tank at a flow of 4 MLD. The PST removes 55% suspended solids. Determine the volume of sludge produced per day if moisture content and specific gravity of sludge are 95% and 1.02 respectively. What will be the volume if its moisture content reduces to 80% after digestion? Also design a digester for sludge digestion period of 80 days. [8]

9. a) With a neat sketch, describe the suitable septik tank effluent disposal method for the area of high ground water table and for the rocky area. [4]

   b) Design a VIP latrine for a household with 10 numbers of people. Assume necessary data suitably. [4]

10. Explain the solid waste disposal by compositing with its merits and demerits. [4]

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

Subject: - Design of Steel and Timber Structure (CE651)

✓ 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**.
✓ Use of IS 800-2007, IS 883-1994, IS 875 and steel tables are allowed.
✓ Assume suitable data if necessary.

1. a) Describe different methods of design with their basic assumptions. [8]

   b) How the steel sections are classified according t their local bucking behaviors? [4]

   c) A single angle ISA 100×75×8 mm is connected to 12 mm thick gusset plate at the ends with six bolts of M20 in one row to transfer tension. Determine the design tensile strength of the angle if gusset is connected to the 100 mm leg. Take f_y = 250 MPa, and F_u = 410 MPa, pr.cl.4.6. [8]

2. a) Explain the method of wind load calculation in the sloped roof as per IS875. [5]

   b) A 7.5m long built-up and laced column has to carry a factored axial load of 1250KN. The column is restrained in position but not in direction at each end. Design the column with single lacing system. Connection shall consist of two channels placed back to back at a suitable spacing. [15]

3. a) Design a built up beam having laterally unsupported span of 4 m, support width 300 mm. Beam is subjected to design imposed load of 40 KN/m and 100 KN at mid span. Depth of beam is limited to 350 mm. [15]

   b) Describe use of stiffners in plate girder with their types and their function. [5]

4. a) Design a single bolted double cover butt joint to connect boiler plates of thickness 12mm for maximum efficiency. Use M16 bolts of grade 4.6. Boiler plates are of Fe410. Find the efficiency of the joint. [10]

   b) Design a timber beam of sal wood having clear span 2.5 m, support width 300 mm and subjected to imposed load of 20 KN/m. [10]

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Subject: - Communication English *(SH651)*

✓ 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. Edit the following text: [5]

   How perfectly sweet said Christine when Sarah confessed that Adit's decision had been made in the war with Pakistan. Now if my Simon was to find himself in such a spot hed funk he would my Simon. When there was such a flap in Cuba and Russia and darling Kennedy was ever so brave Simon wanted to flee to greenland.

2. Read the given text and interpret its meaning in about 150 words: [5]

   This technical term has a wider meaning than the "culture" of history and literature. A humble cooking pot is as much a cultural product as is Beethoven sonata. In ordinary speech a man of culture is a man who can speak languages other than his own, who is familiar with history, literature, philosophy or the fine arts. In some cliques that definition is still narrower. The cultured person is one who can talk about James Joyce, Scarlatti, and Picasso. To the anthropologist, however, to be human is to be cultured. There is culture in general and then there are the specific cultures such as Russian, American, British, Hottento, Inca. The general abstract notion serves to remind us that we cannot explain acts solely in terms of the biological properties of the people concerned, their individual past experience and the immediate situation. The past experience of other men in the form of culture enters into almost every event. Each specific culture constitutes a kind of blueprint for all of life's activities.

3. Read the following passage carefully, make notes and write a summary of it: [5+5]

The valley of Kathmandu is one of the most concentrated repositiories of art and design that exist in the world; it is one of the geratest living art shows imaginable.

Nepal has long been famous for quality work. In the past beautiful bronzes were made, not only for the home market, but for export or sale to polgrim tourists. Today, exquisite bronzes images of gods and goddesses of Hindu and Buddhist pantheons are still fashioned and sold.

The Nepalses wood-carver has always excelled in ornately carved windows and roof supports fashioned in the elegant forms of deities. It is known that the Nepalses architect, Arniko, took the pagoda style of architecture to neighbouring Tibet and from thence to China in the ninth century.

The arts of Nepal, with the exception of stone carving are still very much alive and in the cities of the valley, master craftsmen, artisans and artists are still fashioning masterpieces, following traditions and using techiniques that in many cases stretch back well over a thousand years.

Large areas of the city of Patan are given over to the production of art works, and for the adventurous visitor wih and interest in arts and crafts, there is always an excellent opportunity to see artists and carftsmen at work in their houses.

The advent of tourism in the late fifties acted as a stimulus to Nepalese arts and crafts as it bought with it not only a demand for small souvenirs, but also for high quality items produced by laborintensive methods that could not be copied by machines anywhere in the world. A fine scroll painting, wood-carving or brass image made in Nepal is something unique and exclusive and buyers can feel that they have purchased one of a kind or atleast one a limited edition.

To preserve the national heritage of Nepal, His Majesty's Government has banned the export of antiques of all kinds, but for those with taste and interest, there are many beautiful objects and treasures to buy in the bazars of Kathmandu, Patan and Bhaktapur. Many new bronzes and scroll paintings have been "antiqued" and in such cases it is better to get a musem clearance from the department of Archeology, near the main gate of Singh Durbar in Kathmandu.

Over the past twenty years ,the hands-woven carpet industry has grown and flourished in Nepal. The art of carpet weaving was brought from Tibet.

The mighty peaks of Himalayan ranges are what call many visitors to Nepal in the first place but nevertheless the beauty of the kingdom's art and architecture will linger in the minds of many for long after a vist to the valley of Kathmandu.

4. Answer any two of the following question: [5×2]

a. Point out the differences between knowledge and wisdom. (Knowledge and Wisdom)

b. How did MonnaMarrinna prove herself to be an ideal character? (The Mother of a Traitor)

c. What is the importance of suspension bridges in Nepal? Explain it with reference to the text "Suspension Bridges".

Subject: - Design of Steel and Timber Structure *(CE651)*

✓ 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__.
✓ Use of IS 800-2007, IS 883-1994, IS 875 and steel tables are allowed.
✓ Assume suitable data if necessary.

1. a) Why limit state method is better than working stress method. Explain in brief. [5]

   b) Design a built up column 10 m long to carry a factored axial compressive load of 1080 kN. The column is restrained in position but not in direction at both ends. Design the column with connecting system as battens with bolted connection. Use two channel back to back assume steel of grade Fe 410, E250A and bolts grade 4.6. [15]

2. a) Write design procedure of steel purlin in roof truss. [5]

   b) Design a simply supported I-section beam of span 6 m supports a RCC slab. The compression flange beam is restrained due to its connection with the slab. The beam is subjected to a dead load of 25 kN/m and an imposed load of 20 kN/m. Design the beam. Assume the beam is sufficiently stiff against bearing. [15]

3. a) A shaft transmits load of 100 kN at an eccentricity of 500 mm across a bracket plate bolted to a stanchion. Two rows of bolts 100 mm apart are provided with five bolts per row. The pitch of bolts in each row is 60 mm. Find the greatest force induced in bolt. [8]
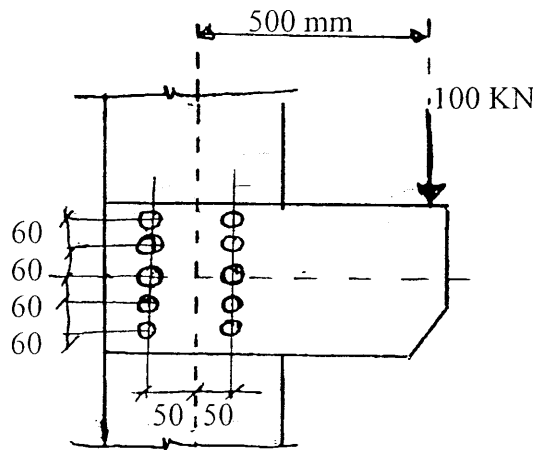
   b) Explain the design concepts of plug and slot weld and its requirement for the connection of members. [5]

   c) Design a solid sal (Select grade) wood column to resist an axial load of 500 KN and moment of 50 KN-m. The length of column is 2 m. [7]

4. a) The High Rise building at Sundhara Kathmandu is to be constructed for a 50 years life, the size of the building is $40 \times 30 m^2$. The height of the building is 50 m. Determine the wind pressure at the site and force on the truss. Where basic wind speed of Kathmandu is 47 m/sec. [10]

   b) Design a slab base for a column ISHB 350 @ 710.2 N/m subjected to an factored axial compressive load of 1000 kN. Concrete pedestal of grade M20. [6]

   c) What is effect of laterally restrained and unrestrained compression flange in bending moment carrying capacity of beam? [4]

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01   TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Bhadra

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

Subject: - Design of steel and Timber Structure (CE651)

✓ 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_.
✓ IS 800-2007, IS 875-1987, IS 883-1994 and _Structural steel Section Books are allowed to use._
✓ Assume suitable data if necessary.

1. Design a tension member of double angle section connected on the both sides of gusset plate. Member is subjected to an axial tension of 300 KN.   [8]

2. Design a simply supported beam with an effective span of 6m for bending, shear and lateral stability. Beam carries a uniformly distributed load of 60 KN/m inclusive of self-weight. The beam is laterally supported.   [14]

3. A timber beam of Sal of select grade carries an udl of 15 KN/m inclusive of its self-weight. The clear span of beam is 4m. Design the timber beam. Take bearing length of support = 230 mm.   [12]

4. A bracket plate 12 mm thick transults a load of 100 KN at an electricity of 25 cm to a column section SC 250 through 14-16 mm diameter. Product grade C and property class 4.6 bolts arranged in two vertical rows 10 cm apart. The pitch of the bolt is 8 cm and load lies in the plane of the bolts. Check the safty of the bolted joints. The grade of steel is Fe410.   [10]

5. Design a built up column to carry an axial load of 1100 KN. The length of column is 8m and is effectively held in position at both ends but not restrained against rotation. Use single lacing system with bolted connection. Grade of steel E250, M10 Bolt, 4.6 grade. The built up column should be consists of double chanel back to back.   [12]

6. Define the terms structural steel, factor of safety and partial safety factor. Explain briefly, how structural steel can resist loads even after local yielding.   [3+3]

7. An ISHB 250 @ 536 N/m column carrying a factored axial load of 900KN. The column ends of machined. Design the splice connection. Use M16 bolts.   [8]

8. Explain the method of calculation of wind load on roof truss.   [4]

9. Design a solid wood column to resist a factored axial load of 75 KN and Factored moment of 12 KNm. The column is made of Sal wood and is 2m long.   [6]

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14