2014-15
B. Tech Civil Engineering
(VIII Semester Examination)
Construction Management (CE-410)

Maximum Marks: 60
Duration: Three Hours

Note: (i) Answer ALL Questions
(ii) All parts of a question should be attempted in one continuation in one copy
(iii) Answer to any part of the question should begin from FRESH page
(iv) All questions carry equal marks
(iv) Assume any data if not given

Q. 1
(a) Write down the definition of the project given by Project Management Institute USA and UNIDO

(b) Define and discuss following types of estimates with degree of accuracy and its use
   (a) Order of Magnitude Estimate
   (b) Approximate Estimate
   (c) Detailed Estimate

(c) Mention the basis for fixing the order of magnitude estimate for following structures:
   (i) Hospital  (ii) Cold Storage  (iii) Dairy Farm  (iv) Water Tank
   (v) Road  (vi) Residential Houses

Q. 2
(a) What do you understand by the term specification? Explain different types specifications used in Construction Industry with examples

(b) Explain the following types of cost with an example:
   (i) Direct Material  (ii) Direct Labour  (iii) Opportunity Cost
   (iv) Cost in Place
   (vi) Imputed Cost
   (vi) Replacement Cost

OR

Q. 2
(a) In what way purchasing of capital equipment is different from routine Purchasing

(b) What are the various issues to be examined, during the purchase of,
construction equipment.

<table>
<thead>
<tr>
<th>Q.3</th>
<th>(a) Discuss concept of wage and its types in detail</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(b) Discuss basic philosophy of various types of rewards offered in lieu of achievement of a worker in the industry</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>OR</td>
<td></td>
</tr>
<tr>
<td>Q.3'</td>
<td>(a) Write down detailed account on the evolution of IIRM in India</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>(b) Discuss various elements of HR Planning</td>
<td>6</td>
</tr>
<tr>
<td>Q.4</td>
<td>(a) Define Fulkerson rule in detail</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>(b) Number the following network diagram shown in Fig. 1 by Fulkerson Rule and then determine the Critical Path</td>
<td>8</td>
</tr>
</tbody>
</table>
Q.4 Calculate EST, EFT, LFT, LST, Free Float, Total Float and Interfering Float of the various activities of the following Project Network Shown in Fig. 2

Fig. 2

Q.5 Calculate Crash cost and Crash Time of following Project Network Shown in Fig. 3. Assume normal cost of the project as Rs.20000/ and indirect cost is Rs. 25 per day
2014-2015  
B.TECH (WINTER SEMESTER) EXAMINATION  
CIVIL  
ENGINEERING HYDRAULICS II  
CE 414

Maximum Marks: 60  
Credit: 04  
Duration: Three hours

Answer all the questions  
Assume suitable data if missing  
Notations used have their usual meanings

<table>
<thead>
<tr>
<th>Q. No.</th>
<th>Question</th>
<th>M.M.</th>
</tr>
</thead>
</table>
| 1(a)   | Explain the following terms  
(i) Critical Flow  
(ii) Spatially varied flow  
(iii) Specific energy  
(iv) Sequent depth  
(v) Hydraulic depth | 05 |

1(b) A rectangular channel 5.2m wide has a discharge of 10m$^3$/s at a velocity of 1.25m/s. At a certain section the bed width is reduced to 3m through a smooth transition. A smooth flat hump is to be built in this contracted section to cause critical flow for flow measurement purposes. Estimate the height of hump necessary for this purpose. Assume no loss of energy at the transition.  

OR

1'(a) If $y_1$ and $y_2$ are alternate depths in a rectangular channel show that  
\[ y_c^3 = \frac{2y_1^2y_2^2}{y_1+y_2} \]  

1'(b) Calculate the discharge corresponding to a critical depth of 1.2m in a triangular channel with side slope $2H : 1V$ and a trapezoidal channel of side slope $2.5H : 1V$ and bottom width 2.5m.  

2(a) Show that for a hydraulically efficient triangular section the hydraulic radius is given by  
\[ R = \frac{y}{2\sqrt{2}} \]  

05  

05  

10  

10  

05  

contd...
2(b) The trapezoidal channel carrying a discharge of 20 \( \text{m}^3/\text{s} \) has a longitudinal slope of 0.0005. (i) Analyse the proportions of an efficient trapezoidal channel section having a side slope 1.5H : 1V. (ii) The most efficient channel section of trapezoidal shape.

<table>
<thead>
<tr>
<th>3(a)</th>
<th>A trapezoidal channel (width ( B = 10 ) m, side slope ( z = 2H : 1V ), bed slope = 0.0016 and the Manning's ( n = 0.02 )) carries a discharge of 90 ( \text{m}^3/\text{s} ). At the downstream of the channel is a small dam that raises the depth of the flow at the dam section equal to 3.5m. Using the direct step method obtain the distance of a section upstream of the dam such that the depth of flow at the section is 3.0m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3(b)</td>
<td>Sketch the possible GVF profiles in the following cases</td>
</tr>
<tr>
<td></td>
<td>(i) Steep – Horizontal – Mild Slope</td>
</tr>
<tr>
<td></td>
<td>(ii) Steep – Steeper – Mild – Milder slope</td>
</tr>
<tr>
<td></td>
<td>(iii) Steep – Mild – Sluice Gate – Mild – Sudden Drop</td>
</tr>
</tbody>
</table>

OR

3'(b) Explain Hydraulic jump with its significance. Derive the Belanger equation for Hydraulic Jump in a rectangular channel.

4(a) Differentiate among

|      | (i) Distorted and Undistorted model |
|      | (ii) Positive and Negative waves |
|      | (iii) Surge and Hydraulic bore |

4(b) A 10m wide rectangular channel supplies 35 \( \text{m}^3/\text{s} \) of water at a normal depth of 2m to a turbine installation. Due to a major reduction in load, the supply to the turbine is cut down to 5 \( \text{m}^3/\text{s} \) only. Determine the velocity of propagation of the surge wave and also the height of the surge.

OR

4'(b) Develop expression for roughness of a distorted model. A river discharging 1:1000 cume/c with \( n = 0.025 \) is modelled to a horizontal scale of 1 : 1000 and a vertical scale of 1:250. What is the model discharge? What is the corresponding roughness of the model?
Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.
Khosla’s charts are attached.

Q.No.   Question                                                                                         M.M.
1(a)   Discuss sprinkler method of irrigation with its suitability conditions. What are the      [07]
       advantages of sprinkler irrigation?
1(b)   What are requirements of a good canal outlet?
       A semi-modular pipe outlet of diameter 15 cm is to be installed on a distributary with its bed
       level and full supply level at 101.15 m and 101.5 m. Set the outlet for maximum discharge
       and calculate the same. The discharge coefficients C may be taken as 0.62. Is the setting
       proportional, sub proportional or hyper-proportional?
       OR

1’(a)  Enlist various factors governing water requirement of crops.                                    [08]

       A watercourse commands an irrigation area of 800 hectares. The intensity of irrigation of rice
       in this area is 50 %. The transplantation of rice crop takes 15 days and total depth of water
       required by the crop is 60 cm on the field during the transplantation. Assuming losses of water
       to be 20 % in the watercourse, calculate the discharge required in the watercourse. Take the
       value of time factor as 0.75.

1’ (b)  What is meant by frequency of irrigation?                                                       [07]

       Compute the depth and frequency of irrigation required for a certain crop with data given
       below:
       Root zone depth = 90 cm
       Field capacity = 24 %
Permanent wilting point = 14%
Apparent specific gravity of soil = 1.50
Consumptive use = 25 mm/day

2(a) Define irrigation efficiency.
10 cusecs of water is delivered into a farm distribution to a 30 hectare field, for 5 hours. Soil probing after the irrigation indicates that 0.4 meter of water has been stored in the root zone. Compute the water application efficiency.

2(b) Define field capacity of soil?
Find the field capacity of a soil with following data:
Dry density of soil = 1.5 g/cm³
Depth of root zone = 1.5 m
Existing water content = 6.0 %
Water applied to the soil = 500 m³
Loss of water in evaporation = 10 %
Area of field = 1000 m²

OR

2'(a) What are the points to be considered while selecting the type of lining?
Design a lined canal to carry a discharge of 40 cusecs. Assume bed slope as 1 in 5000, N=0.0225 and side slope 1.25:1.

2'(b) Comment on the importance of water losses in canals. Discuss the measures to control evaporation and seepage losses through canal.

3(a) Differentiate between Bed load and Suspended load.
Design a channel section by Kennedy's theory for data given below:
Discharge = 30 cusecs
Kutter's N = 0.0225
Critical velocity ratio = 1
Side slope \(- \frac{1}{2}:1\)
B/D ratio \(= 7\)

Also write notes on the following:
(i) Dowla
(ii) Spoil bank
(iii) Berm
(iv) Borrow pit

3(b) Differentiate between initial regime and final regime.

Design an irrigation canal using Lacey's method.
Full supply discharge \(= 30 \text{ cumec}\)
Side slopes \(= \frac{1}{2}(H):1(V)\)
Average size of silt particle = 0.3mm

4(a) Comment on the causes of failure of hydraulic structures due to uplift pressure.

Various dimensions and levels are shown on the profile of hydraulic structures in figure given below. Compute the corrected uplift pressures at the key points of the sheet piles.

4(b) Draw the neat sketch of diversion headwork showing its different component parts on it and explain the function of silt excluder. What are objectives of river training? With neat sketches write brief note on the following:
(i) Guide bund
(ii) marginal bund
(iii) pitched island
4'(a) What is a cross drainage work? [07]

Design drainage waterway and expansion transition of an aqueduct with the following data

**Canal Data**

- Discharge = 30 cumecs
- Bed width = 20 m
- Depth of water = 1.50 m
- F.S.L. = 251.50 m

**Drain Data**

- High flood discharge = 250 cumecs
- High flood level = 247.50 m
- High flood depth = 2.50 m

4'(b) Comment on the necessity of a fall on a canal. Design the crest of Sarda fall for the following:

- Full supply discharge = 10 cumec
- Full supply level u.s/d.s = 301.2/300.0m
- Full supply depth u.s/d.s = 1.2/1.2m
- Bed width of canal = 12 m
- Side slopes of canal = 1(H):1(V)
- Blight’s coefficient = 8
Khosla's Curves For Q. No. 4(a)
2014-15  
B.TECH. EXAMINATION  
CIVIL ENGINEERING  
CONCRETE TECHNOLOGY  
CE - 421

Maximum Marks: 60  
Credits: 04  
Duration: Three Hours

Answer all the questions.  
Assume suitable data if missing.  
Notations used have their usual meaning.

<table>
<thead>
<tr>
<th>Q.No.</th>
<th>Question</th>
<th>M.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>Compare the contributions of C₃S and C₂S to the early strength of concrete.</td>
<td>[06]</td>
</tr>
<tr>
<td>1(b)</td>
<td>How does grading of aggregate affects the properties of concrete mix?</td>
<td>[06]</td>
</tr>
<tr>
<td></td>
<td><strong>OR</strong></td>
<td></td>
</tr>
<tr>
<td>1'</td>
<td>With the help of a neat sketch discuss the various stages required for the manufacture of Portland Cement.</td>
<td>[12]</td>
</tr>
<tr>
<td>2'</td>
<td>Discuss the main factors affecting the shrinkage of concrete.</td>
<td>[12]</td>
</tr>
<tr>
<td></td>
<td><strong>OR</strong></td>
<td></td>
</tr>
<tr>
<td>2'</td>
<td>What do you understand by workability of concrete? Discuss in detail factors affecting the workability of concrete.</td>
<td>[12]</td>
</tr>
<tr>
<td>3(a)</td>
<td>What is meant by Durability of Concrete and what are the causes that affects it?</td>
<td>[06]</td>
</tr>
<tr>
<td>3(b)</td>
<td>Discuss the mechanism of acid attack on concrete.</td>
<td>[06]</td>
</tr>
<tr>
<td>4.</td>
<td>Explain the merits and demerits of various non-destructive tests performed on concrete for the assessment of its quality.</td>
<td>[12]</td>
</tr>
<tr>
<td></td>
<td><strong>OR</strong></td>
<td></td>
</tr>
<tr>
<td>4'</td>
<td>Discuss the effect of height/diameter ratio on the strength of cylinder test specimen.</td>
<td>[12]</td>
</tr>
<tr>
<td>5(a)</td>
<td>What are the main categories of lightweight concrete? Discuss any one of them in detail</td>
<td>[06]</td>
</tr>
<tr>
<td>5(b)</td>
<td>Explain what is meant by Ferrocement? List the advantages and uses of Ferrocement.</td>
<td>[06]</td>
</tr>
</tbody>
</table>
B. TECH. WINTER (VI SEMESTER) EXAMINATION
(CIVIL ENGINEERING)
GEOENGINEERING OF ROCK AND ROCK MASSES (CE – 427)

MAXIMUM MARKS: 60

Note: Answer all questions. The marks of the questions are given in the parenthesis.

Q. 1 Define and differentiate between ‘Rock Material’ and ‘Rock Mass’, based on their uses and properties. (12)

Q. 2 Define weathering and give its engineering classification. How weathering affect the engineering properties of rock masses? (12)

OR

Q. 2' Write short account of deformation of rocks. Enumerate different deformation structures with their significance in engineering aspect of rocky mass. (12)

Q. 3 Discuss the importance of physical and mechanical properties of rocks to be used as aggregate, road metal and rail ballast. (12)

OR

Q. 3'a Discuss the different stages of typical stress – strain curve obtained through UCS testing of rocks. (06)

Q 3'b Write down the method of triaxial compression testing of rocks and elaborate the effect of confining pressure on the compressive strength of rocks. (06)

Q. 4 What do you understand by engineering classification of rock masses? List important rock mass classifications and discuss the philosophy behind Terzaghi’s Rock load Theory or Rock Mass Rating Concept. (12)

Q. 5 Write short notes on any two of the followings:
   a) Core Recovery and Rock Quality Designation (06)
   b) Rock Excavation Techniques and slope modification (06)
   c) Rock mass defects and strengthening (06)
   d) Residual stresses and its measurement techniques (06)
2014-15  
B.TECH. (WINTER SEMESTER) EXAMINATION  
CIVIL  
BRIDGE ENGINEERING  
CE 434  

Maximum Marks: 60  
Credits: 04  
Duration: Three Hours  

Answer all the questions.  
Assume suitable data, if missing.  
Notations used have their usual meaning.  
Use of relevant codes and tables are permitted.

<table>
<thead>
<tr>
<th>Q.No.</th>
<th>Questions</th>
<th>M.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>Show the mode of failure (bending and shear) in R.C piers when subjected to earthquake.</td>
<td>[2.5]</td>
</tr>
<tr>
<td>1(b)</td>
<td>What are the factors which govern the site selection for a bridge?</td>
<td>[2.5]</td>
</tr>
</tbody>
</table>
| 1(c)  | Determine the bending moments in the interior slab panel of a T-beam bridge for the data given below (also refer to Figure 1)  
Clear carriage way width = 7.5m  
Effective span of bridge = 16m  
Live Load: I.R.C Class AA tracked vehicle  
Average thickness of wearing coat = 80mm  
Concrete grade M25 and steel grade Fe415  
Clear cover to reinforcement is taken as 40mm  
Assume depth of main girder as 1600mm @100mm per m of span (includes thickness of slab).  
Assume depth of cross beam as equal to that of longitudinal girder | [10] |

OR

cont'd... 2
1. For the above data determine the live load bending moments due to IRC Class AA wheeled vehicle load.

2. A riveted deck-type plate girder bridge has the following section at the mid-span:
Two cover plates of sizes 450 mm × 12 mm (provided at top and bottom flanges)
Two angles ISA 200 × 200 × 15 mm (provided at top and bottom flanges)
Web of size: 1800 mm × 10 mm

The bridge is to be used for a single broad gauge main line loading. The effective span of the girder is 24 m. The two girders are located at c/c distance of 2.5 m. The floor is open deck type. Take wind pressure = 1.7 kN/m² and \( f_b = 147 \text{ N/mm}^2 \). Find the values of shear force per girder due to DL, LL and impact, at every interval of 2.0 m from left support up to the mid span. Plot the total shear force due to DL, LL and impact. Use the following format:
### Table

<table>
<thead>
<tr>
<th>Dist. from end (m)</th>
<th>Loaded Length (l)</th>
<th>Live Load (kN)</th>
<th>Impact Factor</th>
<th>S.F due to LL &amp; impact per girder</th>
<th>DL Shear per girder (kN)</th>
<th>Total SF per girder (kN)</th>
</tr>
</thead>
</table>

### OR

2'. For the data given in Q. No. 2, design the end stiffeners and intermediate stiffeners. [15]

3. Design the floor beam of a through type single lane truss bridge for broad gauge main line loading (BGML). The effective span of bridge is 30 m. Spacing of the trusses is 5.25 m c/c. The truss is standard Warren type with six panels @5.0 m each. Take dead load of Stringer and track as 2.5 kN/m and 3 kN/m respectively. Depth of girder of Stringer is 750 mm. Also design the connection between the stringer and the cross girder. Maximum reaction from Stringer may be taken as 450 kN. [15]

4. Determine the maximum bending moment and shear force for designing the intermediate longitudinal girder for the data given in Q. No. 1(c) [15]
1(a). What are the two basic structural units required in the formation of clay minerals? Why Montmorillonite clay mineral is measured highly expansive as compared to Illite and Kaolinite clay minerals? Discuss in brief. [05]

1(b). Explain why the under reamed pile is considered safest foundation for black cotton soils. A three bulbs under reamed pile is installed in a medium stiff clay having an unconfined compressive strength of 160 kN/m² obtained from a triaxial test. The length of the shaft from the ground surface to the centre of the first bulb is 10.0 m and the centre to centre distance of bulbs is 1.2 times the diameter of the bulb. The diameters of the shaft and under reamed bulb are 1000 mm and 2500 mm respectively. Determine the safe load of pile in compression and tension. Take factor of safety in compression and tension as 2.5 and 3.0 respectively. [10]

2(a). Briefly describe the SPT and plate load test methods for determining safe bearing capacity of soils. Also discuss the various limitations of these tests. [06]

2(b). Explain the Vesic's theory of load carrying capacity of foundation. A square footing of 2.5 m size is resting at a depth of 2.5 m below the ground level. The properties of foundation soil are $\gamma = 18$ kN/m³, $c = 20$ kN/m² and $\phi = 25^\circ$. The water table is encountered at a depth of 1.5 m below the base of the footing. Take $S_c = 1.28$, $S_q = 1.17$, $S_r = 0.77$, $d_c = 1.21$, $d_q = d_r = 1.13$. Determine the safe load carrying capacity of foundation by IS: 6403-1981 method. Assume the value of factor of safety as 3.0 and saturated unit weight of soil as 21 kN/m³. [09]

OR

2'(a). What type of foundation would you recommend in fine sand strata for the construction of railway over bridge if water table is encountered at a depth of 15.0 m from natural ground level? Discuss the method for determining the load carrying capacity of a mat foundation. [06]
2(b). Explain the Teng's equations for net ultimate bearing capacity of soils for strip and square footings. A square footing resting at a depth of 1.5 m below G.L. is required to carry a net allowable load of 1000 kN. The foundation soil is silty sand with SPT-N value of 15. The water table rises 0.5 m below the base of footing. Determine the size of square footing by using Teng's equation. Take factor of safety as 3.0.

3. A square group of 16 piles each of 0.5 m dia, are installed @ 1.5 m c/c, in a uniform clay stratum of 16 m depth, underlain by rock. The depth of piles extended to 12 m below the surface. The average unconfined compressive strength of clay is 80 kN/m² and liquid limit is 56%. Assume density of clay as 18 kN/m³ below water table and 17 kN/m³ above the water table. The water table exists at 2 m depth below ground level. Take specific gravity as 2.6, void ratio = 0.98 and adhesion factor = 0.75.

(i) Compute the allowable load with a factor of safety 3.
(ii) Determine the settlement of the pile group at that allowable load.

OR

3'. The following data refer to a well foundation for a single line railway bridge:

(i) Net downward load on well including self weight = 17372 kN
(ii) Horizontal force at scour level = 2477.9 kN
(iii) Moment at scour level = 54150.2 kN-m
(iv) Depth of well below scour level = 10.2 m
(v) Saturated unit weight of sand = 20 kN/m³
(vi) Angle of shearing resistance of subsoil = 30°
(vii) Angle of wall friction = 20°
(viii) External diameter of well = 8 m
(ix) Internal diameter of well = 4.8 m
(x) Allowable bearing pressure = 600 kN/m²

Check the lateral stability of the well as per the procedure laid down by IRC: 45(1972).

4(a). With the help of a neat sketch, briefly describe the seismic reflection method of soil investigation.

4(b). The results of a refraction survey at a site are given in the following table. Determine the P-wave velocities in all the layers and thickness of the top layer of the material encountered.

<table>
<thead>
<tr>
<th>Distance from the source of disturbance (m)</th>
<th>2.5</th>
<th>5</th>
<th>7.5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time of first arrival(sec×10³)</td>
<td>11.2</td>
<td>23.3</td>
<td>33.5</td>
<td>42.4</td>
<td>50.9</td>
<td>57.2</td>
<td>63.8</td>
<td>68.6</td>
<td>70.4</td>
<td>72.1</td>
<td>74.9</td>
</tr>
</tbody>
</table>