2017-18
B.E. VIII SEMESTER EXAMINATION
CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
ECE-410

Maximum Marks: 60
Duration: Two hours

Answer all the questions.
Assume suitable data, if required.

Q.No. Question MM

1(a) Explain in detail different phases of project life cycle. [06]

1(b) What is payback period? A company is planning to take a project requiring
initial investment of Rs. 50 crores and is expected to generate Rs. 10 crores
cash flow (CFAT) in 1st year, Rs. 13 crores in 2nd year, Rs. 16 crores in 3rd
year, Rs. 19 crores in 4th year and Rs. 22 crores in 5th year. Calculate the
payback period of the project.

OR

1'(b) What is depreciation? Enumerate various methods of calculating depreciation
and discuss any one in detail. [06]

2(a) What is human resource planning? Why is it necessary? What steps can be
taken by an organization to make human resource planning more effective? [06]

2(b) Enumerate various techniques of inventory control management and explain
in detail about A-B-C analysis of inventory control. [06]

3(a) Discuss the factors which affect the selection of a construction equipment. [06]

3(b) Determine the output of the bulldozer for the following situations:
(i) Material handled sandy loam having swell factor = 30%
(ii) Haul distance = 50 m
(iii) Theoretical capacity = 3 m³
(iv) Actual operating time per hour = 45 mins
(v) Forward speed = 2.4 km/hr
(vi) Reverse speed = 6.0 km/hr

OR

3'(b) List down the factors which affect the economic life of an equipment. Discuss
each factor in detail. [06]

4 For the following CPM network. Calculate EST, EFT, LST, LFT and all
floats of each activity in tabular form. Also find critical path and project
duration.

contd....2
5(a)  A project composed of seven activities as given below:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Optimistic time (days)</th>
<th>Most likely time (days)</th>
<th>Pessimistic time (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
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<td>7</td>
</tr>
<tr>
<td>1-3</td>
<td>1</td>
<td>4</td>
<td>7</td>
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<td>2-4</td>
<td>1</td>
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<tr>
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<td>8</td>
</tr>
<tr>
<td>5-6</td>
<td>3</td>
<td>6</td>
<td>15</td>
</tr>
</tbody>
</table>

What is the project duration when you are 95% (Z = 1.647) sure that the project will be completed in time?

5(b)  Use Simplex method to find the maximum value of

\[ Z = 3X_1 + 2X_2 + X_3 \]

Subject to constraints

\[ 4X_1 + X_2 + X_3 \leq 30 \]
\[ 2X_1 + 3X_2 + X_3 \leq 60 \]
\[ X_1 + 2X_2 + 3X_3 \leq 40 \]

Where \( X_1 \geq 0, X_2 \geq 0, X_3 \geq 0 \)

OR

5'  A small maintenance project consisting of activities given in the table below. If the total direct cost is 30000 and overhead charges are 200/day. Find the normal, optimum and minimum duration of the project.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Normal time (days)</th>
<th>Crash time (days)</th>
<th>Cost of crashing (Rs/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
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<td>6</td>
<td>20</td>
</tr>
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<td>1-3</td>
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<td>25</td>
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<td>2-4</td>
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<td>10</td>
</tr>
<tr>
<td>3-4</td>
<td>10</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>4-5</td>
<td>2</td>
<td>1</td>
<td>40</td>
</tr>
</tbody>
</table>
Answer All Questions.  
Assume suitable data if missing.  
Notations used have their usual meaning.

Q.No.  

1 (a) Define specific energy of an open channel flow. Derive the critical flow condition in an open channel keeping discharge as a variable.  

1(b) Water flows in a rectangular channel at a depth of 1.5 m. A 30 cm high smooth hump produces a drop of 15 cm in the water surface elevation. Neglecting losses, estimate the discharge per unit width of the channel.  

2 A compound channel is symmetrical in cross section and has the following geometric properties:  
Main channel: Trapezoidal cross-section, Bottom width = 15.0 m, Side slopes = 1.5H:1V, Bank full depth = 3.0 m, Manning's coefficient = 0.03, Longitudinal slope = 0.0009.  
Flood plains: Width = 75 m, Side slopes = 1.5H:1V, Manning's coefficient = 0.05, Longitudinal slope = 0.0009.  
Compute the uniform flow discharge for a flow with total depth of 4.2 m by using DCM with (i) diagonal interface method, and (ii) vertical interface method.

OR

2(a) A trapezoidal channel has a bottom width of 3.0 m and side slopes of 1.5H:1V. The longitudinal slope of the channel is 0.0004. (i) Calculate the average shear stress on the channel boundary when the flow takes place at a uniform depth of 1.25 m (ii) What is the mean velocity of flow at this depth of 1.25 m, if the Manning's roughness coefficient of the channel boundary is 0.012.
2(b) A standard lined trapezoidal canal section is to be designed to convey 100 m³/s of flow. The side slopes are to be 1.5H:1V and Manning's $n = 0.016$. The longitudinal slope of the bed is 1 in 5000. If a bed width of 10.0 m is preferred what would be the normal depth?

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

3(b) 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 m³/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 direct step method compute the distance of the section upstream of the dam such that the depth of the flow at the section is 2.5 m.

OR

3'(b) In a very long trapezoidal channel with bed width $B=3.0$ m, side slope $m=1.5$, mannings' $n=0.016$, longitudinal slope $S_o=0.0004$, the normal depth is measured as 1.20m. Determine the type of GVF profile existing at the section X. in the channel when the depth of flow at X is (i) 0.5 m  (ii) 0.8 m  (iii) 1.50 m

4(a) Discuss the classification of surges waves. Also show that the surge wave velocity $V_w = V_1 + \sqrt{\frac{gy_2(y_1+y_2)}{2y_1}}$ where $y_1$ and $y_2$ are the downstream and upstream flow depths, respectively.

4(b) A 4.0 m wide rectangular channel carries a discharge of 12.0m³/s at a depth of 2.2m. Calculate the height and the velocity of a surge produced when the flow is suddenly stopped completely by the full closure of sluice gate at the downstream end.
END SEM. EXAMINATION (2017-18)

B.E. CIVIL IV YEAR

IRRIGATION ENGINEERING

(ECE-415)

TIME = Two Hours.

MM.60

Note: Attempt all questions. Each carries equal marks. Assume suitable data if required.

<table>
<thead>
<tr>
<th>Q. No.</th>
<th>Question</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q. 1 (a)</td>
<td>List out various methods of irrigation used in India. With the aid of sketch discuss furrow irrigation</td>
<td>07</td>
</tr>
<tr>
<td>1(b)</td>
<td>Differentiate among the following:</td>
<td>08</td>
</tr>
<tr>
<td></td>
<td>(i) Duty and delta</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(ii) Base Period and crop period</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(iii) Kor period and kor depth</td>
<td></td>
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<tr>
<td></td>
<td>(iv) Temporary wilting and permanent wilting</td>
<td></td>
</tr>
</tbody>
</table>

OR

1'(a)  Why silt extraction from canal is essential? With the aid of neat sketch describe the working of vortex chamber type silt extractor.                                                                                              | 08    |
| (b)    | What are canal outlets? Describe any type of outlet with aid of neat sketch                                                                                                                                  | 07    |
| Q2.(a) | What is standard silt? Design a canal section using Lacey's method:                                                                                                                                              | 10    |

\[
Q = 30 \text{ m}^3/\text{s}
\]

\[
\text{Silt size} = 0.22 \text{ mm}
\]

\[
\text{Sideslope} = \frac{1}{2} H : 1V
\]

cont'd...
(b) What is water logging? What are its ill effects?  
3(a) Differentiate between Bligh’s and Khosla’s theory for permeable floor design.  
(b) Explain the function of the following in a headwork.
   (i) Undersluices  
   (ii) Divide wall  
   (iii) Silt Excluder  
   (iv) Ram Dhara  
   (v) Head Regulator

© Draw the neat sketch of a head work and properly label it.  
4 Using following data, design the crest and cistern of Sarda type fall.  

Full supply discharge \( Q \) = 40 \( m^3/s \)  
FSL \( \text{us/ds} \) = 218.3m/216.8m  
FSD \( \text{us/ds} \) = 1.7m/1.7m  
Bed width \( \text{,,} \) = 27m/27m  
Bed Level \( \text{,,} \) = 216.5m/215.0m  
Drop \( \text{,,} \) = 1.5 m

OR

4' Using following data, design the contraction and expansion transitions of a syphon 15 aqueduct.  

Discharge of canal = 30 \( m^3/s \)  
Bed width of canal = 20 m  
Depth of water in the canal = 1.8 m  
Bed level of canal = 160.00 m  
High flood discharge of the drainage = 350 \( m^3/s \)  
High flood level of the drainage = 160.5m  
Bed level of the drainage = 158.00 m  
General ground level = 160.00 m
2017-18
B.E. (WINTER SEMESTER) EXAMINATION
CIVIL ENGINEERING
BRIDGE ENGINEERING
ECE 434

Maximum Marks: 60
Credits: 04
Duration: Two Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.
Use of IS:800 – 2007, IRC 6: 2014 and IRC 21: 2000 and Steel Table are allowed

Q.No. | Question | M.M.
--- | --- | ---
1(a) | How the bridges are classified? Explain in detail. | [5]
1(b) | For an economical span, derive the relationship between the cost of superstructure of one span and the cost of substructure of the same span. State the assumptions made in its derivation. | [10]

2. A riveted deck-type plate girder bridge has the following section at the mid-span: [15]
Two cover plates of sizes 550 mm ×12 mm (provided at top and bottom flanges)
Two angles ISA 200 × 200 × 15 (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 20 m. The two girders are located at c/c distance of 2 m. The floor is open deck type. Take wind pressure = 1.5 kN/m² and allowable bending stress (f_b) = 147 N/mm². How the cover plates of plate girder be curtailed? Draw a neat sketch showing the curtailment. Use 22 mm diameter rivets.

OR

2'. Determine the section of a floor beam of a through type single lane truss bridge. The effective span of the bridge is 30 m (6 panels @ 5m). The spacing between the two trusses is 5.25 m. Total live load transferred from stringer to floor beams is 1300 kN for bending moment and 1400 kN for shear force. Impact factor may be taken as 0.50. Dead load of the stringer is 2 kN/m and that of track is 2.7 kN/m. Depth of girder of stringer is 750 mm.

contd....
3. Calculate the rebar in the deck of the T-Beam Slab bridge for maximum bending moment and shear force developed due to dead load and live load of Class AA Tracked vehicle. (Fig. 1) (Take value of $K = 2.52$ for determining shear force due to live load.) (Graph attached)

OR

3'. Evaluate the maximum bending moment and shear force developed in a longitudinal girder of T-Beam Slab Bridge (Fig. 1), due to dead load and live load of Class AA Tracked Vehicle (use Courbon’s method).

Given: Concrete grade: M25, Rebar grade: Fe-415 HYS

4. Determine the stresses developed at the base of the pier (Fig. 2) in the following cases:
   a) Due to dead load of superstructure and self-weight of pier
   b) Due to eccentricity of the live load
   c) Due to longitudinal braking force
   d) Due to wind pressure acting on the pier
   e) Due to buoyancy in flood conditions

Given: Dead loads from each span $= 2000$ kN
Reaction due to live load on one span $= 1000$ kN
Braking force $= 140$ kN
Wind pressure $= 2.4$ kN per sq. m
Total height of the pier $= 10$ m

Cont'd... 3.
Fig. 1. Details of T-Beam Slab Bridge

Fig. 2. Details of Pier
VALUES OF $\frac{M_1}{M}$
a. COEFFICIENT $m_1 = 100$

VALUES OF $\frac{M_1}{M}$
b. COEFFICIENT $m_2 = 100$

Moment Coefficients $m_1$ and $m_2$ for $K = 0.6$.

Moment Coefficients for Slabs Completely Loaded with Uniformly Distributed Load,
Coefficient is $m_1$ for $K$ and $m_2$ for $1/K$. 

Contd.... 5
### Longitudinal Load for Broad Gauge Bridges
(without reduction for dispersion)

<table>
<thead>
<tr>
<th>Loaded Length L (meters)</th>
<th>Tractive Effort kN</th>
<th>Breaking Force kN</th>
<th>Load at L (kN)</th>
<th>Tractive Effort kN</th>
<th>Breaking Force kN</th>
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<tbody>
<tr>
<td>1</td>
<td>73.5</td>
<td>45.1</td>
<td>26</td>
<td></td>
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<td>2</td>
<td>147.1</td>
<td>90.2</td>
<td>28</td>
<td></td>
<td></td>
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<td>34</td>
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<td>40</td>
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<td>9</td>
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<td>24</td>
<td>588.4</td>
<td>404.0</td>
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</tr>
</tbody>
</table>

**Note on Table D-1**

For more detailed tables, refer to Bridge Rules, 1986. Linear interpolation may be used in Table D-1.

**Notes on Table D-2**

1. The longitudinal force has a stepped variation with span. Linear interpolation may not give correct value. It will be safer to use the value for next higher span or refer to more detailed tables in Bridge Rules, 1986.

2. In case of bridges with no rail expansion joints, allowing for dispersion of longitudinal loads to the approaches through the track, the value of the longitudinal loads \( P \) obtained from Table D-2 shall be decreased by \( \Delta P \). \( \Delta P \) will be limited to the extent of 25% of \( P \) subject to a minimum of 157 kN (160). Where suitably designed elastomeric bearings are provided, the value of \( \Delta P \) may be further increased by 40 percent.
2017-18
B. E. VIII SEMESTER (CIVIL ENGINEERING) EXAMINATION
ECE 437  PRE-STRESSED CONCRETE

Maximum Marks: 60  Credits: 04  Duration: Two Hours

Note:
1. Answer all the questions.
2. Assume suitable data if missing.
3. Notations used have their usual meaning.
4. Use of IS: 1343 (2012) is permissible.

Q.No.  Question                                                      M.M.

1. A rectangular concrete beam 300 mm wide and 600 mm deep is pre-stressed with a [15]
   force of 1565 kN applied at 180 mm from the bottom, the force finally reducing to
   1361 kN. The span of the beam is 12.20 m and it carries two equal points loads 45 kN
   each at a distance of 4.60 m from the each support. Find the extreme fibre stress at mid
   span under (i) initial pre-stress and no live load, and (ii) final condition. Assume unit
   weight of concrete as 25 kN/m³.

2. (a) Briefly describe various losses of pre-stressed concrete. How are these calculated? [05]
2. (b) A pre-stressed concrete beam of uniform rectangular section and span 18 meters
   supports a distributed load of 18 kN/m excluding the weight of the beam. Determine
   the suitable dimensions of the beam section and calculate the area of the tendons and
   their position. The permissible compressive stress in concrete is 14 N/mm² while the
   permissible tensile stress in the tendon is 1025 N/mm².

OR

2’. (b) Design a pre-stressed concrete beam of I-section with the following particulars. [10]
   Span = 16 m
   Superimposed load = 30kN/m
   Concrete used: M 40
   Total loss of pre-stressing force = 15%
   Ultimate stress in steel = 1500 N/mm²
   Also check the stresses in beam section at transfer and at service.

3. (a) With the help of neat sketches, discuss the tensile stress distribution in an end block of [05]
   a post-tensioned beam with a single anchorage.
3. (b) A pre-tensioned beam of rectangular section, width of 230 mm and 500 mm overall
   depth is pre-stressed by 10 wires of 7 mm diameter located at an eccentricity of 200
   mm. The maximum shear force at a particular section is 130 kN. The cube strength of
   concrete at transfer is 35 MPa. Calculate the flexural bond stress developed assuming
   (a) The section as un-cracked;
   (b) The section as cracked

OR

3’. (b) A pre-tensioned beam of 10 m effective span has a rectangular section. The member is [10]
   pre-stressed with crimped wires of 7 mm diameter located on the tension side. The

Contd...
cube strength of concrete at transfer is 40 MPa. The internal moment due to the distribution of pre-stress is 5 kN-m.
(a) Determine the vertical tensile stress developed at 1/2 and 3/4 of the transmission length from end.
(b) Design and detail suitable mild steel reinforcement, assuming permissible stress in steel to be 140 MPa.

4. (a) Derive an expression for the area of the concrete section and the factor of safety of a pre-stressed concrete tie member subjected to axial tension.

4. (b) A foundation pile is to carry an axial compressive load of 750 kN acting at an eccentricity of 20 mm with the longitudinal axis of pile. Design the pile and determine the factor of safety for M45 concrete mix. Assume the ultimate tensile strength of pre-stressing steel as 1600 MPa.
Q3(a)**' Explain the working of Rotating Biological Contactors (RBC's) with the help of neat sketch.

Q3(b]**' Find the terminal settling velocity of a spherical particle having mean diameter of 0.65 mm and specific gravity of 2.7 settling through water at 20 °C having laminar flow. Take density, \( \rho_w = 998 \text{ kg/m}^3 \) and dynamic viscosity, \( \mu = 1 \times 10^{-3} \text{ N.s/m}^2 \).

Q4(a) Differentiate between Batch and Continuous flow reactors. A wastewater is being treated in a CFSTR following the first order reaction kinetics with a reaction rate constant equal to 0.2 per day. For a reactor volume of 75 m\(^3\), what should be the flow rate to achieve 90% treatment efficiency? For this flow rate, also calculate the reactor volume if desired treatment efficiency is 99%?

Q4(b) Discuss the sources & effects of Noise Pollution on human health? Also write the legal & preventive measures adopted.

Q4(b)**' Explain the different sources of generation of solid waste and its classification based on origin. Discuss the merits & demerits of waste disposal by Incineration technique.
Q1(a) Write the "Maximum permissible drinking water specification as per IS 10500:2012" and "Effluent discharge standards for public sewers" for the following environmental parameters of water quality.

   a) Mercury
   b) Fluoride
   c) Arsenic
   d) Manganese
   e) Zinc
   f) Hexavalent Chromium

Q1(b) Write a short note on the following 3 parameters explaining about their sources, their drinking water specifications, laboratory techniques for measurement and their adverse impact on human health-

   a) Biochemical Oxygen Demand (BOD)
   b) Alkalinity
   c) Chlorides

Q2(a) Discuss the role of microorganisms in environmentally relevant processes like bioremediation. Explain microbial growth curve.

Q2(b) Explain with the help of diagram "Working & principal of UASB reactor" along with its advantages & disadvantages.

OR

Q2(b)' Differentiate between attached growth processes and suspended growth processes. Explain the biological treatment of wastewater using Oxidation Ponds.

Q3(a) Explain the significance of Coagulation & Flocculation with the help of diagram.

Q3(b) Determine the size of a High rate trickling filter for the following data:

   Flow = 6.5 MLD
   Recirculation ratio = 1.6
   BOD of raw sewage = 300 mg/L
   Desired BOD of final effluent = 30 mg/L
   BOD removed in primary clarifier = 35%

   Also calculate the size of Standard rate trickling filter to accomplish the above requirements. Use NRC formula.