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

1(a) Determine the static and kinematic indeterminacy for the following:

(i) 

(ii) 

(iii) 

1(b) Find the fixed end moments and draw the BMD for the beam shown in Fig. 1. Also find deflection at the mid span. Use Mohr’s theorem. Take $E = 200$ GPa, $I = 10000$ cm$^4$

1'(b) Find the support moments for the continuous beam shown in Fig. 2 and draw BMD using three moment equation. Take $E = 190$ GPa, $I = 8000$ cm$^4$
2. Analyse the frame as shown in Fig. 3 and draw BMD using moment distribution method. 

3. Determine the vertical deflection of joint 'E' for the truss given in Fig. 4. The cross-sectional area of all members is 300 cm$^2$. Take $E = 200$ GPa.

3'. Find the force in the member BC of the truss as shown in Fig. 5. All the members are of the same cross-sectional area. $E = 200$ GPa.

4(a). Find horizontal thrust for the parabolic arch as shown in Fig. 6 and draw BMD. Take $E_c = 180$ GPa, $I_c = 40000$ cm$^4$, $A_c = 200$ cm$^2$. $10$ kN/m.
4(b) An unstiffened suspension cable carries a uniformly distributed load of 10 kN/m over a span of 40 m. The suspension cable is supported on frictionless rollers fixed at the piers. The back stay is inclined at 30° to the horizontal. One pier is 7.5 m below the other and the maximum dip at the lowest point is 4 m below the lower pier. Calculate
(i) The maximum and minimum tension in the cable.
(ii) Horizontal and vertical forces on the pier.

OR

4'(a) Two parabolic arches have a common hinge at B that forms part of a roller bearing and are hinged to the springings at A and C. Find horizontal thrust.

4'(b) The cables of a suspension bridge have a span of 100 m and a central dip of 10 m. Each cable is stiffened by a girder hinged at the ends and at mid span to constrain the cable to retain its parabolic shape. There is uniformly distributed load of 20 kN/m of span over the whole of the span and in addition a live load of 30kN/m and 20 m long. Determine the maximum tension in the cable when live load is situated on the left hand half of the stiffened girder with its right hand end over the central hinge. Also draw BMD.
2017-18
III Year B.E. (Evening)) EXAMINATION
CIVIL ENGINEERING
ENGINEERING HYDRAULICS-I
(ECF-316)

Maximum Marks: 60
Duration: Two 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</td>
<td>For a turbulent flow in a horizontal circular pipe, derive an expression for the shear stress at any radial distance from the axis and pressure drop along the pipe. Explain the significance of distorted models. A model of an open channel is built to a scale of 1/100. If the model has a Manning's $n = 0.013$, to what value of prototype roughness coefficient would this correspond?</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>OR</td>
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<tr>
<td>1'</td>
<td>(a) Laminar flow takes place in a circular tube. At what distance from the boundary does the local velocity equal the average velocity? Estimate the stress on the wall of the pipe as well as centre having diameter of 10 cm. (b) Discuss distinct types of viscometers. (c) Express the drag force acting on a sphere in dimensionless form using the principle of dimensional analysis.</td>
<td>5+5+5</td>
</tr>
<tr>
<td>2(a)</td>
<td>Air flows (along the length) over a 0.8 m wide and 0.6 m long flat plate at speed of 6 m/s. Determine (i) the total drag on one side of plate (ii) boundary layer thickness and (iii) shear stress at the trailing of the plate. Assume the kinematic viscosity and mass density of air as $1.5 \times 10^{-5}$ m$^2$/s and 1.208 kg/ m$^3$.</td>
<td>8</td>
</tr>
<tr>
<td>2(b)</td>
<td>Explain Magnus Effect. Derive Kutta-Joukowsky equation for lift. Differentiate between form drag and pressure drag</td>
<td>7</td>
</tr>
</tbody>
</table>

OR

contd...2
2(b) Explain the terms: (i) Strouhal number (ii) Deformation drag (iii) Lift coefficient (iv) Smooth and rough surfaces.

3 (a) Determine the distribution of discharge in branching system of pipes as shown in the Fig. 1. Assume $n = 1.5$ for the head loss equation $h_r = r Q^n$.

![Diagram of branching system of pipes with dimensions and labels.]

Fig. 1

Explain the major and minor losses in pipes. Discuss the concepts of equivalent length in pipe flow problems.

4(a) Design a Pelton wheel with the following data:
- $N = 500$ rpm
- $P = 9000$ kW
- $H = 300$ m
- $C_v = 0.98$
- $\eta_e = 85\%$
- $\varphi = 0.46$

4(b) A centrifugal pump running at 1000 rpm delivers water against a head of 14.5 m. The vanes are curved backwards at an angle of 30° with its periphery. If the impeller diameter at the outlet is 30 cm and outlet width of 5 cm, determine the discharge. Assume the hydraulic efficiency as 95%.

4(c) Explain the characteristics curves of a pump.
2017–18
END SEMESTER EXAMINATION
B.E.III YEAR (CIVIL)
TRANSPORTATION ENGINEERING (ECE-317)

Maximum Marks: 60

Duration: Two Hours

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

1(a) Explain the importance of studying the behaviour of soil before undertaking highway [7.5]
construction work. Also, discuss the desirable properties of subgrade soil.

1(b) Explain the desirable properties of aggregates to be used in different types of pavement [7.5]
construction.

(OR)

1' Write short notes on the following: [3×5]
   (i) Bituminous penetration Macadam
   (ii) Water Bound Macadam
   (iii) Semi dense bituminous concrete

2(a) Derive the expression for overtaking sight distance used in the design of highways with the [7.5]
help of a neat sketch.

2(b) The speed of overtaking and overtaken vehicles are 75 km/h and 45 km/h respectively. If the [7.5]
acceleration of the overtaking vehicle is 0.98 km/h per second, calculate the safe overtaking
sight distance and minimum length of overtaking zone.

(OR)

2'(a) What is the Group Index (G.I.) method of soil classification? Give the formula for calculation of [7.5]
G.I. value of a given soil sample.

2'(b) Calculate the G.I. value of the subgrade soil with the following properties: [7.5]
   Liquid Limit = 75%, Plastic Limit = 55% and Material passing through No. 200 sieve = 70%.

contd...
3(a) Define gauge of a railway track, enumerate different gauges used in India and discuss their suitability at different locations. Why is the uniformity of gauges necessary in any country? 

3(b) What are the various types of railway stations? With the aid of neat sketches, explain the functioning and types of a Marshalling Yard.

(OR)

3'(a) What do you understand by points and crossings? Explain with the help of diagrams the various types of crossings used on Indian railway tracks.

3'(b) Discuss different types of sleepers used in Indian Railways. Also state the relative merits and demerits of sleepers. A meter gauge (M.G) Indian railway track has a sleeper density of \( n+5 \), determine the number of sleepers under rails for 3.5 km long railway track.

4(a) Briefly explain the following.

(i) Cross wind Component  
(ii) Wind Rose Diagram  
(iii) Basic Runway Length

4(b) An Airport has the runway length of 5.5 km under standard atmospheric conditions. The airport site has an elevation of 250 m and reference temperature of 40°C. If the runway is to be constructed with an effective gradient of 0.35%, determine the actual runway length required for taking off and landing of the aircraft.
2017-18
B.E. (WINTER SEMESTER) EXAMINATION
CIVIL
DESIGN OF STEEL STRUCTURES
ECE-318 N

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 and Steel Table is permitted.

Q.No.  Question  M.M.
1(a)  What are the advantages and disadvantages of bolted connection? [3]

1(b)  The two flats to be lap jointed are 120mm×12mm using M16 bolts of product grade C and property class 4.6. Determine the load carrying capacity in tension of the lap joint comprising of four bolts in two rows at each section at a pitch of 80mm and edge distances of 30mm on each side of the bolt. The gauge distance between the bolts is 60mm and with end distances of 30mm. Take for the flats f_y=250 MPa and f_u=410 MPa. The bolt threads are outside the shear plane. [12]

2(a)  Determine the strength of a standard angle in yielding and block shear of ISA 100×100×10 mm connected to a 12mm gusset plate through 100mm leg, in a single line using M20 bolts of product grade C and property class 4.6. Take f_y=250 MPa and f_u=410 MPa. The bolt threads are outside the shear plane. (Use Clause 10.2.2 onwards for details of bolted connection) [7.5]

2(b)  Determine the size and thickness of a slab base for a column ISMB250@5/1 kg/m which carries a factored axial compressive load of 750kN. The grade of steel is E250 and grade of concrete pedestal is M20 [7.5]

OR

2'.  A battened column consists of 2 ISMC250 placed back to back

contd...2.
at a spacing of 160mm. Length of the column is 5m. The column is hinged at both ends. Use Fe410 grade steel. The column carries an factored axial load of 1350kN.
Determine
i. Depth, thickness and length of the end batten
ii. Spacing of battens
iii. Bending moment and shear in the battens

3(a)
Explain Tension field action in plate girder

3(b)
Design a 24m welded plate girder using 410 grade steel. The plate girder is subjected to factored bending moment and shear force of 8340kNm and 1290kN respectively. The girder is laterally supported through out. Design the cross section for an un-stiffened web. Check for the shear and moment capacity of the section. Take $f_y=250$ MPa and $f_u=410$ MPa

OR

3'(b)
Check the capacity of a load bearing stiffener as a column and also the bearing strength of stiffener to be provided for a welded plate girder of span 36m with the following data.
The girder carries a factored point load of 1000kN at 9m from either end of span
Depth and thickness of web plate is 2700mm and 16mm respectively flange plates are 800mm wide and 30mm thick respectively. Use $f_y=250$ MPa and $f_u=410$ MPa

4.
Define Shape factor.
Determine the collapse load for the portal frame shown below.