B.E. (Civil Engineering) Sixth Semester (C.B.S.)

Steel Structures

P. Pages : 2 **NRT/KS/19/3459**

Time : Four Hours * 0 5 9 3 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Assume suitable data whenever necessary.
7. Illustrate your answers whenever necessary with the help of neat sketches.
8. Use of non programmable calculator is permitted.
9. Use of structural steel table and IS 800:2007 is permitted.

1. a) A tension member is subjected to a factored load of 275kN. Design the section using two angles provided on same side of gusset plate. Length of the member is 2.5m. Provide bolted connection. **13**

b) Determine the shape factor and plastic moment of resistance about centroidal x – x axis for an I – section having Top flange 150 x 20mm, bottom flange 220 x 20mm & web 8 x 450mm. (Take x – x axis parallel to the width of flange). **7**

OR

2. a) Design a discontinuous strut to carry a factored axial load of 300kN. Length of the member between intersections is 3.0m. Section of the member shall consist two angles provided on either sides of gusset. Provide welded connection Take $fy = 250\,N/mm^2$. **12**

b) Find the value of 'W' at collapse for the beam of uniform section shown in fig. 1. **8**

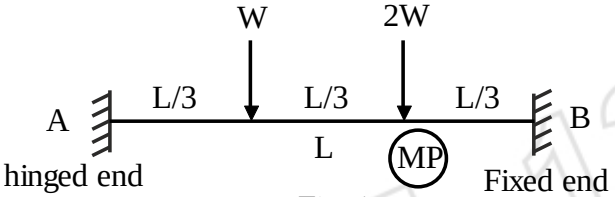

Fig. 1

3. a) A tie FLAT $100\,mm \times 15\,mm$ is welded to another plate as shown in Fig. 2 It is subjected to a factored pull of 300kN Find the minimum overlap required if 8mm fillet welds are used. **10**

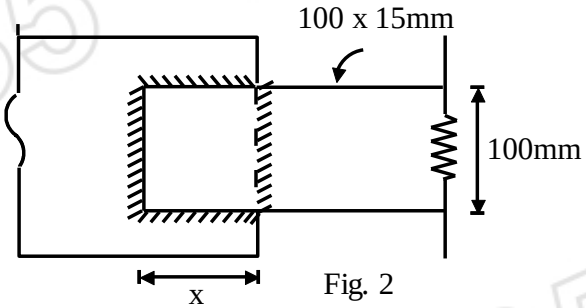

Fig. 2

b) A double cover butt joint, with bolts arranged in chain pattern is to be provided for connecting two tie bars in steel grade Fe 410, each 240mm wide and 12mm thick. Design the joint and determine the strength and efficiency of joint. Assume cover plates 8mm thick, ordinary bolts of dia. 20 mm. **10**

OR

4. a) A beam ISMB 400 transfers a factored reaction of 275kN to a supporting column Flange ISHB 200. Design a stiffened seat angle connection. Use bolts of grade 4.6. **10**

b) Design a splice connection for a beam ISMB 400 to transfer a factored bending moment of 120kNm and factored shear of 80kN. Use ordinary bolts of grade 4.6 and E 300 (Fe 440) grade steel. **10**

5. Design a laterally unsupported beam having clear span of 4.5m simply resting over the end bearings 250mm wide. If carries a service udl of 20kN/m. **20**

OR

6. A welded plate girder of span 30m is laterally restrained throughout its length if has to carry a load of 110kN/m over the whole span be sides its self weight. Design: **20**

1) CIS of Girder
2) End Bearing stiffener
3) Connection of flange to web

7. Design a built up column using two channels back to back. The length of the member is 7.5m between intersections which is effectively held in position but not restrained against rotation at one end. The factored axial load on the member is 2100 kN. Assume Fe410 grade steel. also design double lacing system using bolted connection. **20**

OR

8. a) Design a gusseted base to support ISHB 400 @ 77.4 Kg/m carrying a factored axial load of 2000kN. Use bolted connection. The design bearing strength of the concrete pedestal is $10\,N/mm^2$. **10**

b) A beam-column of effective length 6m carries a factored axial load of 600kN and equal end factored moments of 75 kN-m each about the major axis. Design the member using single rolled section. Assume no sway condition. **10**

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B.E. (Civil Engineering) Sixth Semester (C.B.S.)

Surveying-II

P. Pages : 3 **NRT/KS/19/3460**

Time : Three Hours * 0 5 9 4 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Use of non programmable calculator is permitted.

1. a) Explain the theory of stadia tacheometry. **5**

b) The following observations were taken using a tacheometer fitted with an anallactic lens, the staff being held vertically. **8**

Inst. station	Height of axis	Staff station	Vertical angle	Hair Reading	Remark
P	1.45	BM	-6º12'	0.98, 1.54, 2.10	RL. of BM = 350.0 m
P	1.45	Q	+7º5'	0.83, 1.36, 1.89	
Q	1.57	R	+12º21'	1.89, 2.48, 3.07	

Determine the distance PQ & QR and R.Ls of P, Q and R

OR

2. a) Derive the distance and elevation formulae for line of sight inclined but staff normal to it, when the line of collimation is inclined upword. **5**

b) Two points A and B are on opposite sides of summit. The tacheometer was set up at P on top of summit, and the following readings were taken. **8**

Inst. Station	Height of Inst.	Staff Station	Vertical angle	Hair Reading	Remark
P	1.500	A	-8º 30'	1.150, 2.050, 2.950	R. L of P =350. 0 m
P	1.500	B	-10º 30'	0.855, 1.605, 2.355	

The tacheometer is fitted with on Anallactic lens, the multiplying constant being 100. The staff was held normal to the line of sight.
Find:
a) The distance between A and B.
b) The gradients of lines PA and PB.

3. a) Explain Rankine's method for setting a simple circular curve. **5**

b) Two tangents AB and BC intersect at B. Another line DE intersects AB and BC at D and E such that <ADE = 160º and < DEC = 130º. The radius of first curve is 300m and that of the second is 250m. The chainage of B is 1250m. Calculate all data necessary for setting out the compound curve. **8**

OR

4. a) Calculate the R.L. of the various station pegs on a vertical curve connecting two grades of + 0.7% and - 0.7%. The chainage and the R.L. of intersection point are 850m and 225.50m respectively. The rate of change of grade is 0.1% per 30 m. **6**

b) A reverse curve is to be set out to connect two parallel railway lines 50 m apart. The distance between the tangent points is 200m. both the arcs have the same radius. The curve is to be set out by the method of ordinates from long chord, taking a peg interval of 10m calculate the necessary data for setting the curve. **7**

5. a) Define transition curve. What are the requirement of ideal transition curve? **6**

b) A road bend which deflects 60º is to be designed for a maximum speed of 110 km/hr, a maximum centrifugal ration of $\frac{1}{4}$ and max. rate of change of acceleration of 30 cm/sec^3, the curve consisting of a circular arc combined with two cubic spiral. **8**

Calculate:

i) Radius of circular are
ii) The requisite length of transition curve.
iii) Total length of composite curve.
iv) The chainage of the beginning

and the end of the transition curve, and of the junctions of the transition curves with the circular arc if the chainage of the P.I. is 5325.0 m.

OR

6. a) What are the various types of transition curve? Explain. **6**

b) Two straights having total deflection angle 70º30' are connected with circular curve of radius 1500m. It is required to introduce a curve of length 130 m at the beginning and end of the circular curve without altering the total length of the route. The transition curve to be inserted is a cubic spiral, and the chainage of the point of intersection is 6250m. Calculate **8**

i) The distance between the new and the previous tangent point.
ii) The setting out data for transition curve taking peg interval 20m. and
iii) The data for locating the mid point of the new circular curve from the point of intersection.

7. a) State and explain laws of weights. **4**

b) The altitudes of two proposed stations A and B 120 km apart are respectively 218 m and 1230m. The altitude of the two points C and D on a profile between them are 303 m and 628m respectively. The distance AC = 60 km and AD = 100 km. Determine A & B are indivisible and if necessary find the minimum height of scaffolding at 'B' assuming A as the ground station such that the new line of sight clear the peak by 3.5 M. **9**

OR

8. a) Determine most probable values of the angle A, B, C, D from following data **8**

A = 87º34'22" Wt 2
B = 98º42'18" Wt 3
C = 102º26'9" Wt 4
D = 71º17'4" Wt 1
A+B+C+D = 360º

b) Explain satellite station and reduction to center? **5**

9. a) Define relief displacement and derive the equation. **7**

b) The scale of the photograph is 1cm = 100m **7**
The photograph is 20cm x 20cm. Determine the number of photographs required to cover an area of 180 sq. Km. If the longitudinal overlap is 65% and side overlap is 35%

OR

10. a) In a pair of overlapping vertical photographs the mean distance between two principle points both of which lie on the datum is 6.375 cm. At the time of photographs. the air. craft was 600m above the datum. The camera has a focal length of 150mm. In the common overlap, a tall chimney 120 m high with its base in the datum surface is observed. Determine difference of parallax for the top and bottom of chimney. **7**

b) State and explain principle of terrestrial photogrammetry. **7**

11. a) Write a short note on EDM. **7**

b) Explain GIS and it's components. **6**

OR

12. a) What is Raster model. State it's advantages and disadvantages. **7**

b) Explain Napier's rule of circular parts. **6**

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B.E.(Civil Engineering) Sixth Semester (C.B.S.)

Fluid Mechanics-II

P. Pages : 3 **NRT/KS/19/3461**

Time : Three Hours * 0 5 9 5 * Max. Marks : 80

Notes : 1. Solve Question 1 OR Questions No. 2.
2. Solve Question 3 OR Questions No. 4.
3. Solve Question 5 OR Questions No. 6.
4. Solve Question 7 OR Questions No. 8.
5. Solve Question 9 OR Questions No. 10.
6. Solve Question 11 OR Questions No. 12.
7. Assume suitable data whenever necessary.

1. a) Show that the velocity distribution in case of viscous flow through - pipe is parabolic. **5**

b) An oil of sp. gr = 0.9 and dynamic viscosity 2.5 poise pumped through a 100 mm dia. pipe, 500 m long at a rate of 2 lit/sec. Find - **8**

i) Reynold's number of flow and the type of flow
ii) Pressure required at the pump if the outlet end, which in free and is at 20 m above the pump
iii) What should be the power input, if the over all efficiency of the pump is 65%.

OR

2. a) Assuming the velocity distribution in a boundary layer **6**

$$\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$$

with usual notations. Find the ratio of displacement thickness to momentum thickness

b) Explain the concept of drag and lift, how they are important in field of civil Engg? Also explain the drag on sphere in brief. **7**

3. a) A straight 250 mm diameter pipe, 5 kms long is laid between two reservoirs having difference in water level of 40 m. To increase the discharge an additional 2.5 kms long of same diameter pipe is laid parallel to the first pipe in the second half. Assume frictional factor f = 0.025 in head loss formula $h_f = \frac{f\,LV^2}{2gD}$, for both the pipes, determine increase in discharge. **8**

b) How power is to be transmitted through a pipe during the flow, prove that for the maximum power transmitted through it the head loss is equal to one third of the head at inlet. **5**

OR

4. Three reservoirs A, B and C with water surface elevations 80 m, 68 m and 55 m respectively and connected by three pipes with a common junction J. The pipe details are **13**

Pipe	Dia (mm)	Length (m)	f
AJ	600	900	0.021
BJ	450	550	0.021
CJ	400	1000	0.021

Estimate the discharge in each pipes.

5. a) Establish the condition for the most efficient trapezoidal channel section in the following form **6**

$$\frac{b}{y} = 2\left(\sqrt{1+z^2} - z\right)$$

Where b = bed width, Y = depth of flow 1 : z = side slope (1V : ZH)

b) A trapezoidal channel is to be designed to carry a discharge of 2.5 m^3/sec, Design the most efficient section, providing a bed slope of 1 in 1200 and side slope of 3 horizontal to 2 vertical, Use Chezy's formula with C = 55. **8**

OR

6. a) Prove that for the minimum specific energy value of Froude's number is equal to unity. **5**

b) Differentiate alternate depths and conjugate depth. **4**

c) If Y_1 and Y_2 are the alternate depths in a rectangular channel, show that **5**

$$Y_C^3 = \frac{2Y_1^2\ Y_2^2}{Y_1 + Y_2}$$

Where Y_C = critical depth.

7. a) Establish an expression for head loss through a hydraulic jump developed in a rectangular channel. **6**

b) A rectangular channel 7.0 m wide carries a discharge of 14 m^3/sec at a velocity of 7.0 m/sec. Determine whether hydraulic jump is likely to occur, if so, find: **8**

i) Depts after the jump.

ii) Length and height of the jump

iii) Loss of head of the jump

iv) Type of jump.

OR

8. a) Derive an expression for GVF in the form **5**

$$\frac{dy}{dx} = \frac{S_o - S_e}{1 - F_r^2}$$

with usual notations

b) By taking suitable example, sketch M_1, M_3 S_1, S_2 water surface profiles. **4**

c) A wide rectangular channel carries a discharge of 3.0 m^3/sec per meter width of channel. It has a bed slope of 1 in 10,000. Determine the type of slope of the channel, if Manning's N = 0.015. Depths of flow at the two sections are 1.6 m and 2.0m. What type of surface profile will be developed and which section will be in forward direction? **5**

9. a) Explain undistorted model and distorted model. State the necessity of distorted models. **6**

b) In an 1:40 model of a spillway, the velocity and discharge are 2 m/sec and 2.5 m^3/sec. respectively. Find velocity and discharge in the prototype. State the model law used. **7**

OR

10. a) In case of a distorted model of a canal horizontal scale 1 : 200 and vertical scale 1 : 10 are used. The discharge and bed slope of the model are 1.0 m^3/sec and 1 in 100. Determine the discharge and bed slope of the actual canal. **7**

b) Explain Reynolds model law and Froude's model law In which conditions these laws are used. **6**

11. a) Differentiate impulse and reaction turbines. **4**

b) What are the various efficiencies applicable for a turbines, explain briefly. **5**

c) Define specific speed of a turbine and gives its importance. **4**

OR

12. a) What are various component parts of a centrifugal pump. Explain with the help of sketches. **6**

b) A single acting single cylinder reciprocating pump has following data - **7**

i) Diameter of cylinder = 20 cm
ii) Stroke lengths = 40 cm
iii) Actual discharge = 6.00 lit/sec
iv) Delivery head = 20.0 m
v) Suction head = 4.00 m
vi) Speed = 30 rpm

Find coefficient of discharge, slip and power required to drive the pump. Take efficiency of the pump η = 80%

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B.E. (Civil Engineering) Sixth Semester (C.B.S.)

Environmental Engineering-II

P. Pages : 2 **NRT/KS/19/3462**

Time : Three Hours * 0 5 9 6 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Define sewage, sewer & sewerage system in details. **7**

b) Describe conservancy system & water carriage system. **7**

OR

2. a) Write down the merits and demerits of separate and combined system. **7**

b) Design a main sewer line for a colony of population 20,000. The per capita demand of water supply is 135 LPCD. The sewer line is tobe laid at a slope of 1/600. Use Manning's coeff 'n' = 0.012. The design discharge is 1.5 times. The average discharge and the sewer is to be designed as a half full section. **7**

3. a) Discuss the various stages followed in the construction of sewer. **6**

b) Write a short notes on ventilation in sewer. **7**

OR

4. a) Explain the various systems of house plumbing in brief with the neat sketches. **6**

b) With the neat sketch explain Inverted siphons. **7**

5. a) Draw a layout of conventional sewage Treatment plant & state its functions. **7**

b) For a domestic sewage having 5 day BOD if 250 mg/lit at 20ºC, calculate 1day and 5 days BOD at 12ºC. Assume K= 0.18 per day at 20ºC. **7**

OR

6. a) Discuss physical and chemical characteristics of waste water. **7**

b) Design a Grit chamber for a flow of 8MLD. **7**

7.	a)	Explain in details Activated sludge process.	**7**
	b)	What do you understand by self purification capacity of stream. Explain the process involved in it.	**6**

OR

8.	a)	Explain the working of trickling filter with neat sketch.	**7**
	b)	Discuss in details about sewage forming.	**6**
9.	a)	What are the different types of privies? Explain with neat sketch "Aqua Privy".	**7**
	b)	Explain the following terms. a) Neutralization. b) Equalization.	**6**

OR

10.	a)	Design a septic tank for a small colony of 200 person. Rate of water supply 135 LPCD. Assume suitable data.	**7**
	b)	Explain with neat sketch working of Gobar Gas Plant.	**6**
11.	a)	Define air pollution and Explain various sources of air pollutants.	**7**
	b)	Discuss the various meteorological parameters influencing air quality and pollutant dispersion.	**6**

OR

12.	a)	Write a note on impact of Air pollution on human being.	**7**
	b)	Explain the cyclone separator to control air pollution.	**6**

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