4^{TH} SEM. / CIVIL ./ 2023(S)

TH-1 Structural Design-I

Full Marks: 80 Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10

   a. What is limit state of serviceability.

   b. Write the factor of safety for steel and concrete in WSM.

   c. What is development length ?

   d. What is the maximum compressive stress rectangular beam ?

   e. Why doubly reinforced section is used over singly reinforced section ?

   f. Differentiate between one-way and two-way slab.

   g. What do you mean by moment of resistance?

   h. What do you mean by side face reinforcement?

   i. Differentiate between column and pedestal.

   j. What is the minimum and maximum amount of longitudinal reinforcement permissible in a Column?

2. Answer **Any Six** Questions 6 x 5

   a. A R.C.C. beam 250mm×500mm has a clear span of 5.5m. The beam has 2-20mm diameter bars going into the support. Factored shear force is 140KN. Check for the development length if Fe 415 steel and M20 concrete is used.

   b. Write the assumptions taken in WSM ?

   c. Design a short R.C.C column to carry an axial load of 1600 KN. It is 4m long, effectively held in position and restrained against rotation at both ends. Use M-25 concrete and Fe-415 steel.

   d. Find the moment of a beam having width as 300mm and effective depth as 550mm . The permissible stress in concrete in bending compression and steel in tension are respectively 5.6 $N/mm^2$and 210 N/mm^2.

   e. A singly reinforced beam rectangular beam of width 250mm and 460mm effective depth is reinforced with 3nos of 16mm diameter bars . Find out the moment of resistance of the section.

	f. Explain the terms: balanced, under reinforced and over reinforced sections.	
	g State the different methods of design of concrete structure and explain it.	
3	Design an R.C.C. beam of width 230mm and effective depth of 500mm subjected to a factored moment of 200KNm. Find the reinforcement required.Use M20 concrete and Fe415 steel.	10
4	Design a simply supported T beam of 6m span ,the slab thickness is 100mm & characteristics load including self weight of the beam is 24 KN/m ,given width of support and width of beam as 250 mm &230 mm ,use M20 and Fe415 steel.	10
5	Design a square footing of uniform thickness for an axially loaded column of 450mm×450mm size. The safe bearing capacity of soil is 190KN/m^2. Load on column is 850KN. Use M20 concrete and Fe415 steel.	10
6	Design a two way slab for an office floor of size 3.5m by 4.5m with discontinuous and simply supported edges on all the sides with corners prevented from lifting and supporting a service load of 4kn/m^2 adopt M20 grade concrete and Fe415 bars.	10
7	Design a dog legged staircase for a live load of 5 KN/m^2 rise of the stair is 150mm and tread is 250mm . Ceiling height is 3.6m and width of flight is 150mm use M20 concrete and Fe415 steel.	10

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TH-2 Hydraulics and Irrigation Engineering

Full Marks: 80 Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10

   a. Define Viscosity and write down its unit in C.G.S system.

   b. Define density and its unit.

   c. Write down the relationship between atmospheric pressure, absolute pressure and gauge pressure.

   d. What is the mechanical efficiency of a centrifugal pump? Write down its mathematical formula.

   e. Write down the assumptions of Bernoulli's equation.

   f. What is meant by surface and sub-surface irrigation.

   g. What is crop season.

   h. Differentiate between GCA and CCA.

   i. Write down Dicken's and Ryve's formula for estimation of flood discharge.

   j. What is meant by " runoff".

2. Answer **Any Six** Questions. 6 x 5

   a. Derive expression for total pressure exerted on vertical surface.

   b. Find the head loss due to friction in a pipe of diameter 300mm and of length 50m through which water is flowing at a velocity of 3m/sec by using (i) Darcy's formula,(ii) Chezy's formula for which take C= 60.

   c. Describe briefly the operation of reciprocating pump.

   d. Describe hydrological cycle with a neat sketch.

   e. Define base, delta and duty and derive the relationship between them.

   f. Discuss at least two remedies adopted for water logging.

   g. What is meant by cross drainage work. Explain it's necessity.

3	A pipe line carrying oil of specific gravity0.87, changes in diameter from200mm diameter at a piston (A) to 500mm diameter at a piston (B) which is 4m at a higher level.If the pressure at "A" and "B" are 9.81N/cm2 and 5.886N/cm2 respectively. The discharge is 200m3/sec. Determine the loss of head & direction of flow.	10
4	A simple U-tube manometer containing mercury is connected to a pipe in which an oil of specific gravity 0.8 is flowing .The pressure in the pipe is vacuum. The other end of the manometer is open to the atmosphere. Find the vacuum pressure in pipe if the difference of mercury level in the two limbs is 20cm and height of oil in the left limb from the centre of the pipe is 15m below.	10
5	Explain in detail the various causes of failure of an Earthen Dam with sketches.	10
6	Draw a general layout of a barrage. Also explain the functions of different parts.	10
7	Describe the methods to prevent water logging.	10

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TH-3 LAND SURVEY - I

Full Marks: 80 **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10

   a. Name different types of chain, which are used in surveying.

   b. What is local attraction and how it is detected?

   c. What is the principle of chain surveying?

   d. Draw the conventional symbol of temple and level crossing.

   e. What is cadastral surveying?

   f. What is the least count of a transit theodolite?

   g. What is temporary bench mark?

   h. When do you apply resection method in plane table surveying.

   i. What are the sources of error in chain surveying?

   j. Define line of collimation.

2. Answer **Any Six** Questions 6 x 5

   a. Explain the errors in chaining.

   b. The bearings were observed during traversing 182°35’ and 126°30’. If the declination at the place is known to be 1°40’ E. Then find the bearings of the line.

   c. A steel tape 20m long, standardised at 15°C with a pull of 10kg was used to measure distance along a slope of 4°25’. If the mean temperature during the measurement was 10°C and pull applied 16kg, determine the correction required per tape length. Assume coefficient of expansion = $112X10^{-7}$per °C, cross sectional area of tape = $0.08cm^2$ and Young’s Modulus E = $2.1X10^6kg/cm^2$.

   d. Distinguish between rise fall method and height of instrument method.

   e. Write down the different characteristics of contours.

   f. Define W.C.B. and Q.B in compass surveying.

   g. Write the Bowditch rule for balancing a traverse.

3 The following offsets were taken from a chain line to a hedge: 10

Distance in meter	0	10	20	30	40	60	80	100	120	140	160
Offset in meter	0	2	2.5	2.2	3	3.4	2.8	2.6	3.2	2.9	2.7

4 What are different methods of plane tabling? Describe any one method in detail. 10

5 The following observations were made during the testing of a level. 10

Instrument at	Staff reading at station	
	A	B
A	1.225	1.375
B	0.850	0.500

RL of station A is known to be 356.5. Calculate the RL of station B. Also calculate the error in line of collimation and state clearly whether it is inclined upwards or downwards.

6 Find the area of closed traverse by calculation of area by co-ordinate method. 10

Line	Latitude	Departure
AB	+225.5	+120.5
BC	-245.0	+240.0
CD	-180.5	-140.5
DA	+200.0	-220.0

7 The bearings observed at the stations of a closed traverse are given below. 10
Check whether the bearings are correct. If not, correct the bearings.

Line	F.B.	B.B.
AB	122°15’	302°15’
BC	66°00’	243°45’
CD	308°15’	133°00’
DA	198°00’	15°30’

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TH-4 HIGHWAY ENGINEERING

Full Marks: 80 Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1.		Answer **All** questions	2 x 10
	a.	When Indian road congress formed and what was its objective?	
	b.	What is RoW and formation width in Highway?	
	c.	What is Emulsion and write its types.	
	d.	What are Pneumatic tyre and sheep's foot rollers?	
	e.	Draw any two traffic control signals and write their meaning.	
	f.	Write at least four causes of pavement failure.	
	g.	How landslide can be controlled in hilly roads?	
	h.	What is Kerb? Write two functions of it.	
	i.	Calculate the values of ruling minimum radius assuming design speed as 80km. Assume e=0.07 and f=0.15.	
	j.	What is necessity of providing cross-drainage works?	
2.		Answer **Any Six** Questions	6 x 5
	a.	Calculate the safe stopping distance for design speed of 60kmph for (a) two way traffic in two lane road, (b) two way traffic in a single lane road. Assume coefficient of friction as 0.4 and reaction of driver as 3.0 secs.	
	b.	Write briefly, the necessity of providing curves in highway.	
	c.	Elaborate Penetration test of Bitumen with figure.	
	d.	Differentiate between Rigid pavement and Flexible pavement.	
	e.	What is surface drainage and what are the methods for providing it?	
	f.	What is corrugations and discuss its remedial measures.	
	g	Write a short note on Hot-Mix plant.	
3		What are the requirements of a good aggregate? Why and how abrasion test is performed in aggregate?	10
4		What are the methods of providing super elevation? If the design speed of a highway is 100kmph and horizontal curve of radius 180m on a certain area, calculate super elevation required to maintain this speed. Take coefficient of friction as 0.18.	10
5		What is the purpose of Stabilization? Explain how lime stabilization is carried out in pavements.	10
6		Draw a neat sketch of flexible pavement showing different layers and give a brief idea about Sub-Grade preparation.	10
7		Describe failures in Rigid pavement and its maintenance.	10