Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

Munshi Nagar, Andheri (West), Mumbai – 400058

END SEM Examinations June 2024

Program: Civil Engineering

Duration: 3hr

Course Code: PC-BTC601

Maximum Points: 100

Course Name: Construction Engineering and Management

Semester: VI

Instructions:

1. Question no. 1 is compulsory
2. Attempt any 4 questions out of remaining 6 questions.
3. Neat diagrams must be drawn wherever necessary.
4. Assume Suitable data if necessary and state it clearly.

Q. No.		Questions	Points	CO	BL	Module
1	a	A construction company purchases 20,000 bags of cement annually.	6	CO3	BL2	4
		Each bag of cement costs ₹ 400 and the cost incurred in procuring each lot is `₹ 150. The cost of carrying is 30%. What is the most economic order quantity? What is the average inventory level? If the lead time of procuring cement is 2 weeks, determine the reorder point.				
	b	Discuss typical project life cycle along with different stages in a construction project.	6	CO1	BL1	1
	c	The activity details and their predecessors are given below along with their activity times.	8	CO2	BL3	3
		Perform CPM calculations and find the critical path and the corresponding project completion time. Also convert AOA network to AON network.				

Activity	Predecessors	Activity time (weeks)
A	---	4
B	A	3
C	A	2
D	B	5
E	B	3
F	C,D	4
G	E,F	3

Q. No.		Questions	Points	CO	BL	Module
2	a	Discuss the purpose of EVM and state the significance of SV, CV, SPI, CPI.	5	CO2	BL2	5
	b	Draw the job layout for the construction of the high rise building.	5	CO1	BL2	4
	c	Draw the network of the project	10	CO2	BL4	3

Perform CPM calculations and Find the critical path and expected project completion time. Calculate Total float, Free float.

Activity	IPA(S)	Durations in Weeks
A	---	5
B	---	11
C	---	8
D	C	7
E	A	9
F	A,B,D	4
G	C	12
H	C	5
I	E,F,G	10
J	F,G	5
K	H	5
L	H	9
M	J,K	3
N	L	6

a	The details of the projects are shown below	9	CO2	BL3	3

Activity	Immediate Predecessor(s)	Durations (Weeks)		
		t_o	t_m	t_p
A	-----	6	8	10
B	-----	4	6	8
C	A	10	12	16
D	A	8	10	12
E	A	2	6	10
F	B	6	8	10
G	B	3	5	8
H	C	7	9	13
I	F	8	12	16
J	G,H	1	3	6
K	E,I,J	4	7	12

(a) Draw project network.
(b) Find the critical path and the corresponding expected project completion time.
(c) What is the probability of completing the project on or before 50 week

b	Discuss common causes of time and cost overrun in the case of highway construction project.	6	CO2	BL2	5
c	Define lean construction and discuss the different types of waste in lean construction.	5	CO2	BL2	5
a	What is an accident? Suggest the types of personal protective equipment (PPE) to be used to minimize accidents in construction project.	6	CO2	BL2	6
b	List the construction equipment required for the construction of a highway project and also discuss the hazard associated with the construction equipment used during highway project.	6	CO2	BL2	1,6

			Marks	CO	BL	
4	c	Prepare A, B and C ranking of the different items for the data given below	8	CO2	BL3	4

Item No.	Annual Usage	Price (₹)
101	200	40.00
102	100	360.00
103	2000	0.20
104	500	20.00
105	6000	0.04
106	1200	0.80
107	120	100.00
108	2000	0.70
109	1000	1.00
110	80	400.00

5	a	Prepare a checklist for (i) Shuttering work (ii) Concreting work	6	CO2	BL2	6
	b	Discuss the traits/skills of project manager for the successful delivery of the construction project.	8	CO1	BL2	1
	c	Define organization and draw a typical line and staff organization structure along with its advantages.	6	CO1	BL1	4
6	a	Differentiate Quality control and quality assurance	3	CO1	BL2	6
	b	Discuss direct and indirect cost of accident	7	CO1	BL2	6
	c	A project consists of 5 activities as shown below	10	CO3	BL4	7
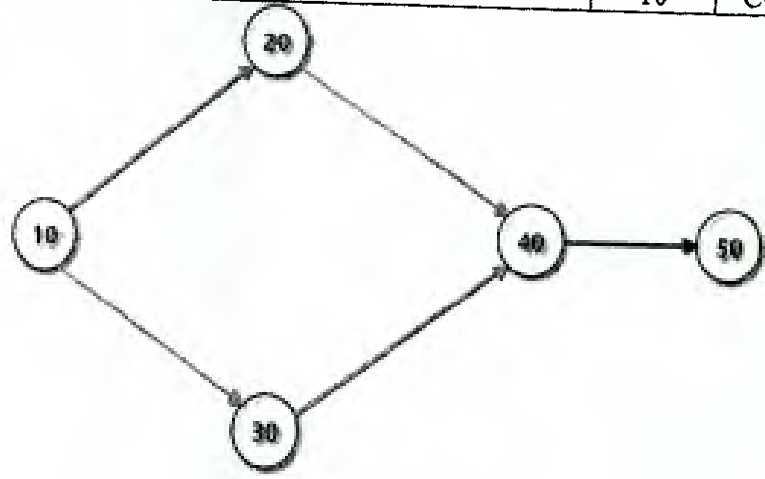
Determine optimum project completion time assuming indirect cost is ₹ 3000.0 per week. Draw time scaled diagram for each stage of crashing

Activity	Normal		Crash	
	Time (weeks)	Cost ₹	Time (weeks)	Cost ₹
10-20	3	12,000.0	2	16,000.0
10-30	6	18,000.0	3	24,000.0
20-40	2	20,000.0	1	23,000.0
30-40	4	16,000.0	2	21,000.0
40-50	5	30,000.0	4	35,000.0

Q. No.		Questions	Points	CO	BL	Module
7	a	Justify the statement that highway project is a unique construction project.	6	CO1	BL3	1
	b	Discuss the different forms of organization.	6	CO1	BL2	4
	c	Discuss the quality and safety plan for Highway construction project.	8	CO1	BL3	6

Standard Normal Probabilities
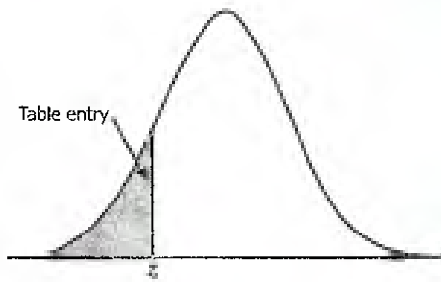
Table entry

Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
-3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
-3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
-3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
-1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
-1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
-1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
-0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

Standard Normal Probabilities
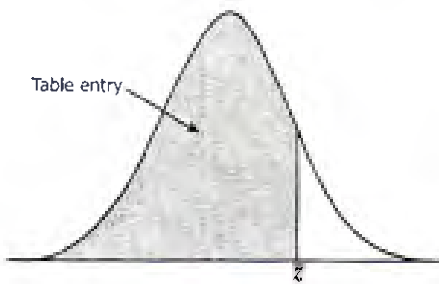
Table entry

Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

End Semester Exam – June 2024 Examinations

T.Y.B.Tech
12/6/24
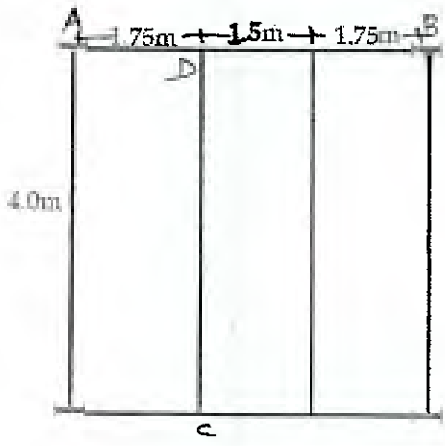
Program: B.Tech –Civil Engineering   **Duration: 3 Hour**

Course Code: PC-BTC602   **Maximum Points: 100**

Course Name: Design Of Steel Structures   **Semester: VI**

Notes:

1. Assume any missing data and state the same clearly
2. Use of IS 800-2007 and steel table is allowed.
3. Draw neat sketches to illustrate your answers
4. For all steel plates and angles, fy = 250MPa, fu= 410MPa

Q.No.	Questions	Points	CO	BL	Module
1.	The member of a roof truss carries the following unfactored loads : DL = 40kN (Compressive); LL = 35kN (Compressive) WL = 70kN (Tensile) a What will be the design loads as per IS 800:2007 load combinations? b. Design the element as a tension member and also design its connection with 10mm thick gusset plate using 4.6grade bolts c. Check the member designed above for the safety in compression according to the load combinations generated.	20	1,3,6	1,3,6	1,2,3,7
2)	A floor of hall has beam layout as shown in figure below: Design beam AB and CD. Loads are as follows :	20	1,5	1,5,6	1,5

3.a)	RCC slab depth = 120mm Floor finish load = 1.5kN/m^2 Live load = 3.5kN/m^2 Wall thickness = 230mm (All beams support walls of height 2.5m) Design the beams and provide all necessary checks *assuming the beam to be laterally supported* A single angle strut (loaded through single leg) carries a design compressive force of 110kN. The length of member between centres of intersection is 1.5m. Design the section as per IS 800:2007. *Assume the connection to be hinged with two bolts at each end*	10	1,3	3	3
3.b)	A column carries a design axial load of 850kN. Design the column section using rolled steel section when *both ends are restrained against rotation and translation.* Length of member is 5.0m	10	3	3	3
4.	Design a built up laced column to carry 1250kN design axial load using two channels facing back to back. Also design lacing and its connection using 4.6grade bolts. The column is hinged at both ends and the length is 4.25m. Draw neat sketch showing all the details	20	3	3	3
5.a)	Design a framed connection for an ISMB 250 to transfer 85kN factored reaction to ISMB 350 using 4.6grade bolts. Draw neat sketch to show connection details	10	2	2	6
5.b)	Explain the procedure for calculating wind load on roof truss. A roof truss shed is to be built in Delhi for an industry. The height of building is 8m at the eaves. Determine the basic wind pressure. Calculate live load intensity on the truss if the angle of slope of roof is 25°.	10	4	1,6	7
6.a)	Design a gusseted base connection for a column of section ISHB 300 to transfer a design load of 950kN on a concrete pedestal of M20 grade.	12	4	4	4

6.b)	Design a welded connection for a single angle tension member ISA 150x150x10. The angle is subjected to an axial force of 210kN.	08	2	2	2
7.a)	Explain the classification of sections : plastic, compact, semi-compact and slender based on moment – rotation characteristics	05	1	1	1
7.b)	Explain the advantages and disadvantages of using steel as a structural material	05	1	1	1
7.b)	A simply supported beam ISMB 350 has been used over a span of 5.5m to carry a design load of 15kN/m. Check the safety of the beam in *shear, flexure and deflection* when the beam is *laterally unsupported*	10	5	5	5

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester June 2024 Examinations

19/6/24

Program: T.Y.B. Tech. Civil

Course Code: OE-BTC612

Course Name: Sustainable Development

Duration: 3hrs

Maximum Points: 100

Semester: VI

Notes:

1. There are TOTAL SEVEN MAIN questions, each of 20 points.
2. Question No.7 is compulsory. Attempt any 4 questions from Q.1 to 6.
3. Write answer to each question on a new page.
4. Answers to be accompanied with appropriate sketches/facts & figures/table or chart/graph/diagram/flowchart wherever necessary or required.

Q.No.	Questions	Points	CO	BL	Module
1.	**Answer the following:**				
A	Explain in detail the outcomes of the environmental issues addressed by the following international environmental agreements: i. Kyoto protocol 1997 ii. Paris agreement 2016	8	1	2	2
B	What is the role of developed Countries in the sustainable development?	4	3	1	2
C	Explain in detail the term "National Sustainable Development Strategies". State the principles of NSDS and enlist different types of NSDS.	8	2	1	2
2.	**Answer the following:**				
A	With the help of a flow chart explain the relation between Socio Economy and Sustainable Development.	5	4	1,2	1
B	The SD concept impacted with its history. Write down about Five year plans and commencement of NITI Ayog in India for implementation of sustainable development. How NITI Ayog making it possible to make India Sustainable through different policies on State and National Level.	15	3	3	1,2

3.	**Answer the following:**					
A	State various tools for sustainability assessment. Explain in detail the Benefit Cost analysis method with a proper example.	8	4	1,2	2
B	Compare the strong and weak measure of sustainability.	4	2	3	3
C	Write a note on "Sustainability Development Analytical Grid (SDAG) Tool Kit" put in practice by United Nations (UN).	8	2	2,3	1,3
4.	**Answer the following:**					
A	Explain the hydrological cycle. (2) Explain how the anthropogenic activities are causing an imbalance in this cycle. (3)	5	1	1	1
B	Write a note on Brundtland Commission & its Outcomes.	5	1	2	1
C	Write down Constitutional Provision for Sustainable Development.	5	2	3	3
D	What are the four major components of Sustainable development? Brief one of its component 'The climate change'.	5	2	2	1
5.	**Answer the following:**					
A	How the social and economic sustainability are interconnected? Explain it with the help of example.	5	3	2,3	5
B	State various national & international green building rating systems. Explain the credit / rating system of GRIHA. Give an example of a GRIHA rated building in India that you know.	5	3	2,3	4
C	'Global warming occurs when carbon dioxide (CO_2) and other air pollutants collect in the atmosphere and absorb sunlight and solar radiation that have bounced off the earth's surface. Since the Industrial Revolution, the global annual temperature has increased in total by a little more than 1 degree Celsius. Between 1880—the year that accurate record keeping began—and 1980, it rose on average by 0.07 degrees Celsius every 10 years. Since 1981, however, the rate of increase has more than doubled: For the last 40 years, we've seen the global annual temperature rise by 0.18 degrees Celsius ' From the excerpt given above, it can be concluded that industrial growth is one of the main causes of global warming, which in turn is linked to climate change and climate change is a biggest challenge towards sustainable development. Explain how the United nations (UN) and its Member States are coming up with sustainable solutions and trying to cope up with this challenge.	5	3	3	2
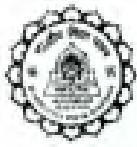
D	How does the term CARBON TAX implemented? Mention its Pros and Cons.	5	2	2	5
6.	**Answer the following:**				
A	Write a short note on Life Cycle Assessment (LCA) w.r.t. following points: i. Definition ii. Why to use LCA iii. Who should use LCA iv. Objective v. Case Study or Example	10	3	2	4
B	Compare the feasibility and sustainability of the available renewable energy sources in India in terms of its availability, applicability, benefits and limitations.	5	2	2	4
C	What is mean by Global Warming 3C? Explain in details the Emissions Gap Report (EGR) 2022.	5	2	2	1-3
7.	**Answer the following:**				
A	Prepare a report note/ Research paper on literature review on innovations for Sustainable development in various sectors such as environment, renewable energy, water resources, agriculture, forestry etc.	15	3	3	6,7
B	'Sustainable development is a multi-perspective approach'. Do you agree with this statement? If yes, explain how? If no, explain why? (3) Justify your answer with appropriate examples. (2)	5	3	3	1-7

ग-५. B. Tech

Program: Civil Engineering

Course Code: PC-BTC604

Course Name: Design of RCC Elements

Duration:3 hrs

Maximum Points: 100

Semester: VI
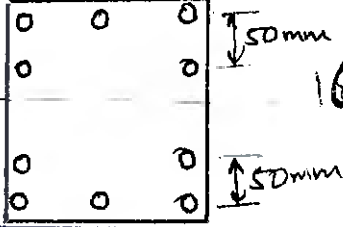
Notes:

1) Attempt any five questions.
2) Draw reinforcement details wherever necessary.
3) Use of IS 456:2000 is permitted.

Q.No.		Questions	Points	CO	BL	PI
Q1	a)	What do you mean by Limit State and explain the assumptions made in LIMIT State of collapse(Flexure).	05	1	2	2.3.2
	b)	Derive design stress block parameters for doubly RC sections for LSM of design subjected to flexure.	10	1	1,2	1.2.1, 1.3.1
	c)	When is it required to design a doubly reinforced beam?	05	1	2	1.2.1, 1.3.1
Q2	a)	RC section 300mmx650mm depth overall and reinforced with 3-25mm dia is used as simply supported beam over an effective span of 5m. Determine the maximum udl beam can carry safely. Use M 30 and Fe-500	08	1	3	2.1.3
	b)	Design RC beam of size 300x500 mm and span 5m subjected to service udl of 100kN/m .Use M-35 and Fe 415	12	1,2	6	2.4.1
Q3	a)	An isolated TEE beam section has an effective depth of 750mm ,effective flange width of 750mm ,rib width of 300mm ,slab depth of 100mm .Design the beam to carry ultimate moment of 900kN-m Use M-30and Fe-415.	10	1	3	2.3.1
	b)	Design one way slab panel of room of RCC residential building having dimensions 2.5mx 6m. Give appropriate checks. Use M30and Fe 500.Draw reinforcement details	10	1,2	6	2.4.1
Q4	a)	Design a RC slab for an interior panel of a balcony of a residential building. The size of panel is 3mx 5m.Assume live load of 3kN/m2, soil fill of 200mm.Draw bottom reinforcement plan and section along short span. Give appropriate checks. Use M35 and Fe 500	20	1,2	6	2.1.3

Q5	a)	What are the functions of distribution steel in one way slab?	05	1	2	1.4.1
	b)	Design short helically reinforced column to resist service load of 12.00kN.Use M35 and Fe500.Draw reinforcement details	15	1,2	6	3.1.6
Q6	a)	A column of dimension 500mmx500mm is subjected to axial load of 1500kN.Design isolated footing for column assuming SBC as 200kN/m2.Use M30 and Fe 500	15	1,2	6	3.1.6
	b)	Calculate load carrying capacity of column of size 500mmx600mm comprising of 10-25mm dia. Use M-30 and Fe-500.	05	1	2	1.3.1
Q7	b)	Determine ultimate load carrying capacity of following column (300 x500)mm subjected to uniaxial bending .Assume fs=0.87fy.Use M30 and Fe 500.Also find eccentricity of the load. Take xu/D i. 0.7 ii. 1 	20	1,2	4	2.4.1

****

End Semester Examinations: June 2024

T.Y. B.Tech

Program: B.Tech. in Civil Engineering

Course Code: PE-BTC621

Course Name: Analysis of Indeterminate Structures

Duration: 3 Hours

Maximum Points: 100

Semester: VI

1. Attempt any FIVE questions out of SEVEN questions.
2. **Answers to all sub questions should be grouped together.**
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary and state the same clearly.

Q.No	Questions	Points	CO	BL	Module
Q1(a)	**Find the reactions at C in the frame shown in figure using flexibility method.**	10	1	3,4	1
Q1(b)	**Find the force in the redundant member AC of the truss loaded as shown in figure below by flexibility (compatibility) method. (Take force in member AC as the redundant force.) Assume AE to be same for all the members.**	10	1	3,4	1

Q2(a)	Analyse the continuous beam shown in figure using three moment theorem and find the support moments at A and B.	12	1	4	2
Q2(b)	A two hinged parabolic arch of span 25 m and rise 4 m carries a concentrated load of 40 kN at a distance of 6 m from the left support. Determine the horizontal thrust in the arch. The moment of inertia (MI) of the section of the arch varies as $I = I_0 \sec\theta$, where I_0 – MI of the section at the crown.	08	1	3,4	2
Q3(a)	Find the reaction at A for the beam loaded as shown in figure below using the theorem of least work.	12	1	3,4	3
Q3(b)	What are the conditions to be satisfied while analyzing a structure using (i) Elastic analysis (ii) Plastic analysis	05	1,2	1,2	1 to 7
Q3(c)	How is the information about the degree of static and kinematic indeterminacy useful in analyzing an indeterminate structure?	03	1,2	1,2	1 to 6
Q4(a)	Find the unknown displacements in the frame shown in the figure below by slope deflection method.	16	2	3,4	4
Q4(b)	Define stiffness coefficient K_{ij} and state the important properties of the stiffness matrix.	04	2	3,4	6

Q5	Analyse the the rigid jointed frame loaded as shown in the figure below by moment distribution method.	20	2	3,4	5
Q6(a)	Using stiffness method, find the unknown displacements in the rigid jointed frame loaded as shown in the figure below.	14	2	3,4	6
Q6(b)	Calculate the stiffness coefficients and write the stiffness matrix for the beam shown in figure w.r. to the coordinates indicated in the figure.	06	2	3,4	6
Q7(a)	Find the shape factor of an isosceles triangle of base width of 150mm and a height of 200 mm.	08	3	3,4	7
Q7(b)	A continuous beam is subjected to working loads as shown in figure below. If M_P = 80 kN-m, calculate the (true) load factor for the beam.	12	3	3,4	7

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester June 2024 Examinations

24|6|24

Program: T.Y. B. Tech. Civil

Duration: 3hrs.

Course Code: PE-BTC622

Maximum Points: 100

Course Name: GIS Science & Applications

Semester: VI

Notes:

1. There are **TOTAL SEVEN MAIN** questions, each of **20 points.**
2. **QUESTION 1 & 2 is COMPULSORY.**
3. From the remaining **FIVE** Questions Solve **ANY THREE.**
4. Assume suitable data, wherever necessary and State it clearly.
5. Write **answer to each question on a new page.**
6. Answers to be accompanied with **appropriate sketches/facts & figures/table** or **chart/graph/diagram/flowchart** wherever necessary or required.

Q.No.		Questions	Points	CO	BL
1.	a	Explain the developments in GIS during the period of 1980 – 2000 and the period after 20000 (2) Discuss how GIS technology is different than any other Information technology. (2)	4	1	1,2
	b	Define Geodesy (1) and describe different earth surfaces (3)	4	1	1,2
	c.	Enlist (atleast 2) spatial data sources and (atleast 2) non-spatial data sources required for any spatial data analysis in a GIS.	4	1	1,2
	d.	Define 'Spatial Analysis' (1) State different types of spatial analysis done using GIS. (3)	4	1	1,2
	e.	State any three digital terrain model approaches to represent the earth surface. (1) Explain, in short, any two of these models. (3)	4	1	1,2
2.	a.	Write a detailed note on the site visit to Vikram Sarabhai Space Application Centre (VSSAC) and Center for Environmental Planning and Technology (CEPT) in Ahmedabad conducted on 3rd and 4th May 2024. Include: i. Objectives of the visit (1) ii. Key activities and observations (2) iii. Technologies and tools demonstrated (3) iv. Insights gained about GIS applications in real-world scenarios (2) v. Your reflections on the overall experience and its relevance to your studies (2)	10	1,2, 5	3
	b.	As a module, you have worked on the real-world application of GIS for mapping of Land Surface Temperature (LST) and hot spot mapping as a part of environmental monitoring and urban planning. Explain the process of Land Surface Temperature (LST) and Hot-spot mapping, for a region you have considered, by using remote sensing satellite data and GIS tools. Your answer should include: i. Significance of LST and its applications (1) ii. Data source used for LST mapping (2)	10	5	3
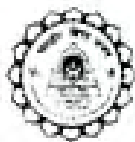
		iii. Steps involved in processing satellite data to derive LST (4) iv. Methods for identifying and mapping hot spots (3)			
3.	a	Explain the distortions associated with each type of map projection and how these distortions affect spatial data interpretation.	8	1	1,2
	b	Describe the following topology building in vector data structures with proper examples of how these topologies are applied: i. connectivity (4) ii. contiguity (4) iii. containment (4)	12	3	2,3
4.	a	Describe the open geospatial consortium (OGC) standards and services and their significance in Web GIS.	5	3	1,2
	b	Explain the concept of a spatial database management system (SDBMS) (5) Discuss the database structure models used in SDBMS and their importance. (10)	15	4	1,2
5.	a	Define a geodatabase and explain its role in managing GIS data.	5	4	1,2
	b	Discuss the importance of metadata in GIS.	5	2	1,2
	c	Provide an overview of network analysis in GIS. (4) Describe a real-world application where network analysis has been utilized, detailing the steps and data involved. (6)	10	4	2,3
6.	a	Write a note on 'Distributed GIS'. (4) State the characteristics (2), advantages (2), and challenges (2) of WebGIS.	10	3	1,2
	b	Explain, in detail with proper examples, the single theme spatial analysis in GIS – buffer and dissolve. (4)	10	4	2,3
	c	Explain, in detail with proper examples, the multiple themes spatial analysis in GIS –clip, split, erase. (6)			
7.	a	Describe the quadtree data structure and its use in GIS. (4) Explain how it helps in the efficient storage and retrieval of raster data. (4)	8	3	1,2
	b	Explain the role of coordinate reference system (CRSs) in ensuring accurate spatial data analysis and integration in GIS. (8) Write a short note on 'Global datum – WGS 84' (4)	12	1,2	1,2

END SEMESTER EXAM – JUNE 2024

Program: Civil, Engineering   Duration: 3 hr.

Course Code: PE-BTC 651   Maximum Points: 100

Course Name: SOLID & HAZARDOUS WASTE MANAGEMENT   Semester: VI

Notes:

1. Q.1 is compulsory & attempt any four from remaining six
2. Illustrate answer with neat sketches wherever required.
3. Make suitable assumptions where necessary and state them clearly.

Q.No.	Questions	Points	BL	CO	Module
1	Attempt any four: 1. Strategy for waste management. 2. Any five sources of solid wastes with examples. 3. Make a list of cost components of solid waste collection system. 4. Explain any five landfill siting considerations as per MSW, 2016. 5. Make a list of components of CHWTSDF. 6. Construction and demolition waste	20	1	2,3	1-7
2	A. Solid waste from a new industrial area is to be collected in large containers, some of which will be used in conjunction with stationary compactors. Based on traffic at similar parks, it is estimated that the average time to drive from the garage to the first container and from the last container to garage each day will be 16 and 22 min, respectively. If the average time required to drive between containers is 6 min (dbc) and the one way distance to the disposal site is 15.5 mi/h for which speed limit is 55 mi/h (88.5 km/h). Assume 8-hour workday, S=0.133; a=0.016; b=0.018; Assume off route factor (W) as 0.15. • Determine the pickup time per trip (in hrs/trip) • Determine the time per trip (in hrs/trip) • Determine the number of trip that can be made per day (in trip/day) • Determine the actual length of the work day(in hours) B. Discuss the chemical composition/characteristics of solid waste. C. Calculate the Moisture & energy content of solid waste sample for the composition given below. Also determine the chemical composition of organic fraction with and without water and Sulphur for given data,	04+08 +08	2	1,2,3	2,3

Component	Wet weight	MC H	% by weight (Dry Basis)					
			C	H	O	N	S	Ash
Food Waste	9	70	48	6.4	37.6	2.6	0.4	5.0
Paper	34	6	43.5	6.0	44	0.3	0.2	6.0
Card Board	6.0	5	44	5.9	44.6	0.3	0.2	5.0
Plastics	7.0	2	60.0	7.2	22.8		-	10
Textiles	2	10	55	6.6	31.2	4.6	-	2.5
Rubber	0.5	2	78	10		2.0		10
Leather	0.5	10	60	8.0	11.6	10	-	10
Yard Waste	18.5	60	47.8	6	38	3.4	0.3	4.5
Wood	2.0	20	49.5	6	42.7	0.2	0.1	1.5

3	A. What do you mean by the transportation of solid waste? Also discuss requirements form transportations as per MSW, 2016 (any three) and methods along with advantages /disadvantages.
	B. Discuss the stationary container system with the following points,
	  • Flow diagram of operational tasks in SCS.
	  • Advantages/Disadvantages
	  • Types of system used in SCS.
	C. Explain shortly Kerbsite/alley and Block collection system for collection of solid waste.
		08+08 +04	2	1,2,3		3

4	A. Define: Incineration. Explain objectives of incineration process for solid waste.
	B. Explain any two unit operations at processing of solid waste at processing station.
	C. Discuss the Material Recovery Facility with following points,
	  • Meaning of MRF
	  • Types of MRF
	  • List of components/equipment's at MRF
	  • Issues at MRF facility
		05+ 05 +10	2	1,2,3		4

5	A. What do you mean by Vermicomposting? Discuss the phases of vermicomposting and advantage/ disadvantages of vermicomposting. B. Explain shortly the stages of Anaerobic Digestion of solid waste in biogas digester. C. Define: Composting. Explain the phases of composting process of solid waste.	10+ 04+ 06	2	1,2,3		4,7
6	A. What do you mean by leachate? Also make a list factors affect leachate generation & treatment or controlling mechanisms. (Any four)	05+ 05+ 10	2	1,2,3		4,7

	B. Make a list of reasons for landfill gas control. Estimate the desired landfill area for a community with population of 40000 assuming the solid waste generation rate is 3.0 kg/capita/day and specific weight of solid waste is 450kg/m3. Average depth for compacted solid waste is 5.5m. C. Discuss the landfill method with its important components and also explain the sanitary landfilling methods for Municipal Solid waste.				
7	A. What do you mean by hazardous waste? Explain any three characteristics of hazardous waste. Explain the effect of hazardous waste on the environment. B. Draw a labelling format of hazardous waste on storage container or transport vehicle. C. Discuss the storage site design criteria for storage of hazardous waste as per hazardous waste management rules, 2016.	10+ 04+ 06	2	1,2,3	6,7

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examinations June 2024

(2023-24)

Program: T.Y. Civil Engineering (UG) Sem VI   Duration: 03 Hrs.

Course Code: PE-BTC 633   Maximum Points: 100

Course Name: Professional Elective-II: Open Channel Flow

Semester: VI

Notes:

- Attempt **any five** questions.
- Answer to all sub questions should be grouped together.
- **Figure** to right indicates full marks.
- Assume suitable data wherever necessary and state it **clearly**.

Q. No.	Questions	Points	CO	BL	Module
1	(a) What do you understand by hydraulically efficient channel? Derive an expression for hydraulically efficient triangular channel.	10	3	2	1
	(b) A trapezoidal channel of the most efficient cross-section carries a discharge of 30 cumecs at a slope of 1 in 600. Design the channel. Take N = 0.024 and side slope on is 1 H: $\sqrt{3}$ V.	10	3	3	1
2	(a) Explain the significance of Specific energy, momentum equation and Specific force in an open channel flow.	10	1	3	2
	(b) What is the necessity of providing hump in the channel? Explain channel with hump in subcritical flow and supercritical flow condition.	10	1	5	2
3	(a) Write short notes on: (i) Venturiflume; (ii) Standing wave flume.	10	1	2	2
	(b) A rectangular channel has 5.0 m width and 3.0 m depth. If the bed slope of the channel is 1 in 1350, Find: (i) minimum width of throat, (ii) maximum height of the hump to produce critical depth, without changing the water level at the entrance. Consider Manning's n = 0.022.	10	1	4	2
4	(a) Differentiate between: Gradually varied flow (GVF) & Rapidly varied flow (RVF) and derive dynamic equation of gradually varied flow (GVF) in case of a wide rectangular channel.	10	2	2	3

BharatiyaVidyaBhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examinations June 2024

(2023-24)

	(b) Classify water surface profiles in an open channel. Explain any one in detail with neat sketch.	10	2	3	3
5	(a) Explain Chow's methods for Computation of Gradually Varied Steady Flow.	10	2	2	4
	(b) A rectangular flume 2 m wide carries discharge at the rate of 2 m3/sec. The bed slope of the flume is 0.004. At a certain section the depth of flow is 1m. Calculate the distance of the section downstream where the depth of flow is 0.90 m. Solve by single step method. Assume rugosity coefficient as 0.014. Is the slope of the channel mild or steep?	10	2	4	3
6	(a) What is positive and negative surge in open channel? Explain with neat sketches.	10	2	5	3
	(b) Determine length of back water curve by an afflux of 2.5 m in rectangular channel of width 40 m and depth 3 m. The slope bed is 1 in 12,000. Take Manning's constant N =0.022.	10	2	2	3
7	(a) Explain differential equation of spatially varied flow (SVF) for: (i) increasing discharge; and (ii) decreasing discharge.	10	2	4	5
	(b) Explain with neat sketches incipient motion, mechanism of sediment Transport and sediment load. State the terms used clearly and its practical significance.	10	2	4	6/7

****

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

Munshi Nagar, Andheri (West), Mumbai – 400058

END SEM Examinations June 2024

Program: Civil Engineering

Course Code: PE BTC 636

Course Name: Watershed Development & Management

Duration: 3hr

Maximum Points: 100

Semester: VI

Instructions:

1. **Attempt any five questions.**
2. Neat diagrams must be drawn wherever necessary.
3. Assume Suitable data if necessary and state it clearly.

Q. No.		Questions	Points	CO	BL	Module
1	a	Describe the need and importance of rainwater harvesting in the present climate change scenario for watershed development & management	8	CO1	BL2	1,5
	b	Sketch & discuss the parts of watershed.	4	CO1	BL1	1
	c	Discuss in detail the engineering measures for soil conservation.	8	CO1	BL3	4
2	a	Explain in detail the causes of watershed deterioration.	6	CO1	BL2	1,2
	b	Classify and discuss check dams.	8	CO1	BL2	4
	c	Calculate the availability of water in Roof Top RWH system for a group of 5 family members.	6	CO2	BL3	5
		Size of roof is 12 m X15 m, with average annual rainfall is 1000 mm and runoff coefficient is 0.75. Also calculate availability of water for number of days along with its %. Daily consumption of water is 135 lits/capita/day.				
3	a	Explain in detail types of soil erosion in a watershed	10	CO1	BL2	3
	b	Discuss about Adarsh Gram Hiware Bazar in the context of pre and post watershed development and management programme.	10	CO2	BL3	7
4	a	Classify bench terraces as per slope and also draw neat labelled diagram.	5	CO1	BL2	4
	b	Discuss in detail the classification of land capability.	10	CO1	BL2	3
	c	What are the roles and responsibilities of Watershed development team (WDT)?	5	CO2	BL2	6

5	a	Explain in detail different characteristics of watershed and their importance in the context of watershed development and management.	10	CO2	BL3	2,3
	b	Discuss the need & importance of drone survey in watershed development & management.	7	CO1	BL2	7
	c	Brief about the reconnaissance survey for the overall development of the watershed.	3	CO2	BL2	1,6
6	a	As an engineer a project is assigned to you for the watershed development & management of a particular village, for such project discuss in detail the watershed preparation plan.	10	CO2	BL2	6
	b	Discuss the role of watershed management process to address the issues such as deficient water supply, flooding, energy shortages, food shortage, erosion/sediment control, pollution of water bodies and ecology.	10	CO1	BL2	2
7	a	Discuss the utility of following structures in watershed development & management. (i) Stone Bund (ii) Grassed waterways (iii) Gabions	6	CO1	BL2	4
	b	Discuss the objectives of PMKSY along with WDC 1 & WDC 2.	8	CO1	BL2	6
	c	Discuss the importance of assessment of surface water and groundwater in the watershed development and management programme.	6	CO1	BL2	2

BharatiyaVidyaBhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

Munshi Nagar, Andheri (West), Mumbai – 400058

END SEM Examinations June 2024

Program: Civil Engineering

Duration: 3hr

Course Code: PE-BTC644

Maximum Points: 100

Course Name TQM and MIS in construction

Semester: VI

Instructions:

1. **Attempt any five questions.**
2. Use A-4 size graph paper to draw control chart
3. Neat diagrams must be drawn wherever necessary.
4. Assume Suitable data if necessary and state it clearly.

Q. No.		Questions	Points	CO	BL	PI
1	a	Explain in detail the importance of responsibility matrix in ISO certified organization.	8	CO1 CO3	BL3	1.4.1
	b	Explain with flow chart the process of ISO certification.	8	CO1	BL3	1.3.1
	c	Differentiate between corrective and preventive action.	4	CO2	BL1	1.4.1
2	a.	Following data refers to the cost of quality. Segregate them into their respective category and determine the appraisal and prevention cost in construction project.	10	CO1	BL2	1.4.1

Cost of calibration of CTM-Rs. 35000	Cost of laboratory equipment- Rs. 18,50,000
Cost of redesign- Rs 2,50,000	Salary of QC engineer- Rs 30,42,000
Cost of design review- Rs.84,000	Fees paid to auditor-Rs 2,25,000
Cost of material rejected by customer- Rs 2,25,000	Cost of vendor analysis- Rs. 35000
Cost of rework-Rs. 1,90,000	Developing checklist- Rs 7500
Testing materials-Rs. 5,30,000	Lost order due to poor quality- Rs. 8,50,000
Conducting training program- Rs. 6,50,000	Cost of addressing complaint-Rs.65000
Costs of late delivery- Rs. 25000	Cost involved in fault investigation- Rs 1,25,000

Q. No.		Questions	Points	CO	BL	PI
	b	Discuss in details the fundamental principles of QMS as per ISO 9000.	10	CO2	BL5	2.3.1
3	a	What are the common causes of variations in the construction quality?	4	CO2	BL2	1.4.1
	b	Discuss the role of IAF in ISO.	4	CO1	BL2	1.3.1
	c	A RMC plants produces self-compacting concrete 800 m³ per day. Following are the observed flow table results of 6 samples to verify workability of concrete at different time intervals. Develop mean & range chart and comment on the process.	12	CO2	BL4	2.3.1

Observations sheet for flow table results at RMC plant

Day	Observed workability of concrete at different time intervals					
	8.00-10.00	10.00-12.00	12.00-14.00	14.00-16.00	16.00-18.00	18.00-20.00
1	470	585	469	494	480	512
2	485	505	589	524	501	486
3	462	469	475	458	466	516
4	494	478	469	454	574	498
5	510	501	584	477	493	502
6	465	510	585	475	584	516
7	570	466	574	469	570	542
8	454	484	567	484	472	533
9	560	577	486	554	569	498
10	515	467	458	468	477	526

4	a	What is audit? Discuss the essential requirements of audit plan.	08	CO2	BL2	2.1.1
	b	Swastik India Ltd. manufactures Soil Modified Bricks (SMB) to make a low cost sustainable material for the construction. A team of QC engineer decided to pull a random sample of 100 to find the defective products. Table shows the data from the last 25 days of production. Develop the appropriate control chart. Is the process in statistical control? What variation is in the control chart? *(Refer Pg 4, for different coefficlent)*	12	CO1	BL2	2.1.2

Observations sheet for Swastik India Ltd.

Day number	Units inspected	Number defective	Day number	Units inspected	Number defective	Day number	Units inspected	Number defective
1	100	22	10	100	27	19	100	21
2	100	33	11	100	31	20	100	26
3	100	24	12	100	26	21	100	24
4	100	20	13	100	31	22	100	32
5	100	39	14	100	24	23	100	43
6	100	24	15	100	22	24	100	25
7	100	24	16	100	22	25	100	21
8	100	29	17	100	29			
9	100	41	18	100	31			

5	a	Explain in detail the section 7 "Product realization" of ISO 9001.	10	CO4	BL2	1.3.1
	b	Following data refers to the ***Run test*** regarding quality characteristic of paver block manufacturing company. Perform ***the median test*** and **up-down test**. State whether the process is in control or not. (Consider z-value of ± 2.0 for comparison 95.5 level of acceptance).	10	CO 3	BL4	2.3.2

Sr. No	comp. strength	Sr. No	comp. strength	Sr. No	comp. strength	Sr. No	comp. strength
1	21.85	11	22.15	21	20.18	31	19.74
2	22.46	12	21.96	22	23.16	32	22.63
3	20.91	13	24.68	23	24.05	33	24.81
4	23.81	14	23.18	24	20.17	34	23.96
5	22.55	15	24.61	25	23.48	35	22.74
6	22.19	16	23.51	26	20.69	36	23.18
7	24.36	17	22.64	27	20.78	37	20.92
8	23.42	18	22.56	28	20.66	38	23.10
9	22.67	19	23.18	29	23.41	39	24.69
10	22.93	20	20.61	30	24.62	40	21.65

	a	Explain in short different stages involved in the audit execution.	08	CO4	BL2	2.1.2
	b	A company manufactures stoneware pipes for sewer line construction with production capacity of 1200 units per day. Defects in each components are recorded during testing. Based on the given data, draw the appropriate control chart and comment on the state of control.	12	CO3	BL4	2.3.1

6

Observations sheet for stoneware pipes

Lot	Sample size	No. of defects in the sample	Lot	Sample size	No. of defects in the sample	Lot	Sample size	No. of defects in the sample
1	1200	25	11	1200	53	21	1200	48
2	1200	24	12	1200	49	22	1200	44
3	1200	26	13	1200	51	23	1200	46
4	1200	28	14	1200	40	24	1200	57
5	1200	32	15	1200	56	25	1200	54
6	1200	44	16	1200	64	26	1200	42
7	1200	33	17	1200	47	27	1200	48
8	1200	34	18	1200	58	28	1200	46
9	1200	42	19	1200	57	29	1200	54
10	1200	45	20	1200	59	30	1200	45

	a.	Describe in detail the section 4 "Quality Management System" as per ISO 9001.	08	CO2	BL1	3.1.2
	b.	How six sigma helps to improve the performance of an organization?	05	CO 2	BL2	1.3.1
	c	"A QC engineer inspected the installation of lifts in 25 Towers comprises of G+30 Storied. Following defects were observed in the operation of Lifts: 1. Lighting problem was observed in 26 lifts; 2. Electric fan was not working in 13 lifts; 3. Difference in floor level of lift and passage was observed in 9 lifts; 4. Emergency alarm was not working in 14 lifts; 5. Display screen was not working in 18 lifts. If there are two lifts provided in each tower, determine the Six sigma value of a construction project by referring following table.	07	CO3	BL3	2.3.1

7

Sigma Level	Defects per Million Opportunities	Percentage Yield
1σ	691,462	31
2σ	308,537	69
3σ	66,807	93.3
4σ	6,210	99.38
5σ	233	99.977
6σ	3.4	99.99966

Reference table for Mean and Range Chart

Tabular values for X-bar and range charts

Subgroup Size	A_2	d_2	D_3	D_4
2	1.880	1.128	——	3.268
3	1.023	1.693	——	2.574
4	0.729	2.059	——	2.282
5	0.577	2.326	——	2.114
6	0.483	2.534	——	2.004
7	0.419	2.704	0.076	1.924
8	0.373	2.847	0.136	1.864
9	0.337	2.970	0.184	1.816
10	0.308	3.078	0.223	1.777
11	0.285	3.173	0.256	1.744
12	0.266	3.258	0.283	1.717
13	0.249	3.336	0.307	1.693
14	0.235	3.407	0.328	1.672
15	0.223	3.472	0.347	1.653
16	0.212	3.532	0.363	1.637
17	0.203	3.588	0.378	1.622
18	0.194	3.640	0.391	1.608
19	0.187	3.689	0.403	1.597
20	0.180	3.735	0.415	1.585
21	0.173	3.778	0.425	1.575
22	0.167	3.819	0.434	1.566
23	0.162	3.858	0.443	1.557
24	0.157	3.895	0.451	1.548
25	0.153	3.931	0.459	1.541

4

END SEM EXAMINATION JUNE -2024

Program:T. Y. B. Tech. Civil   Duration: 3 hours

Course Code: PE – BTC – 662   Maximum Points: 100

Course Name: Traffic Engineering & Control (Elective)   Semester: VI

(i)   Assume suitable data if required

Q.No.	Questions	Point	CO	BL
Q.1.				
(a)	Discuss the advantage and disadvantage of Traffic signals.	06	01	01
(b)	Discuss IRC guideline for installation of signals	06	02	01
(c)	The 15 minutes traffic count on a cross road (1) and road (2) during peak hours are observed as 178 vech./lane and 142 vech./lane respectively approaching the intersection. If in the direction of heavy traffic flow, the amber time required is 3 second and 2 second for two roads based on approach speed. Design the signal timing by trial cycle method. Assume an average time headway of 2.5 second during green phase. Also, draw a phase diagram.	08	02	03
Q.2.				
(a)	Discuss Origin – Destination Study. Enlist the methods for conducting O – D study.	07	01	02
(b)	Discuss the procedure for conducting O – D study, includes following points in the discussion (i) house hold information (ii) journey information (iii) sample size	08	01	02
(c)	Discuss the factors governing trip generation and trip distribution.	05	01	02
Q.3.				
(a)	Discuss Important findings about traffic based on report submitted by NHAI and IRC in 2006 and 2008.	05	02	02
(b)	Discuss manual method for traffic volume study	05	02	01
(c)	The self-contained town consist of four residencial area 'A', 'B', 'C' and 'D' and two industrial area 'X' and 'Y'. The generation equation shows that for a design year in equation, the trip from	10	02	04

home to work generated by each residencial area per 24 hours are given in the table 1.

There are 3700 jobs in industrial area 'X' and 4500 jobs in Industrial area 'Y'. it is known that the attraction between zone is inversely proportional to square of journey time between zones. The journey time in minutes from home to work are given in table 2. Calculate and tabulate the internal zonal trip for journey from home to work.

Table 1. trips from home to work

Residential area	trips from home to industries
A	1000
B	2250
C	1750
D	3250

Table 2. journey time from home to Industries

Zone	Industry 'X'	Industry 'Y'
A	15	20
B	15	10
C	10	10
D	15	20

Q.4.

(a) The spot speed study were carried out at the stretch of road and consolidated data are given in the following table, calculate (i) Space mean speed (ii) Time mean speed (iii) Variance and Std. Deviation | 10 | 02 | 03 |

Speed range	0 -10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Mid speed	5	15	25	35	45	55	65	75
frequency	3	22	55	105	130	110	74	16

(b) A single lane road of 50 km long is to be widen to two lane road at the cost of 24 lakh Rs/km including all the improvement. The vehicle operating cost on single lane road is 2.8 Rs. per km per | 10 | 01 | 03 |

	vehicle and The vehicle operating cost on two lane road is 2.4 Rs. per km per vehicle. The average traffic expected on single lane road is 3000 per day and on two lane road 3200 vehicles per day over a design period of 20 years. The maintenance cost of existing single lane road is Rs. 30,000 and for two lane Rs. 42,000 per km per annum. If the rate of interest is 10 %. Determine the project is worthwhile or not by Benefits – Cost Ratio.			
Q.5.				
(a)	Discuss the scope of traffic engineering	08	02	01
(b)	The street ABCD run from north to south, the length of each section is given in table below. The details of observations of moving observer team are given in table below. Calculate traffic flow and running speed in each direction. Also, calculate journey speed in each direction	12	02	04

Table 1. length of section

Road Section	Length (m)
AB	600
B	INTERSECTION
BC	1000
C	INTERSECTION
CD	500

Table 2.

Direction of travel	section	Time (Sec.)	Vehicle count		
			Opp. Dire.	overtaking	overtaken
SOUTH BOUND TRAFFIC	AB	152	25	3	4
	B	15	--	--	--
	BC	172	31	2	2
	C	13	--	--	--
	CD	138	25	4	4
NORTH BOUND TRAFFIC	DC	132	50	2	2
	C	12	--	--	--
	CB	160	55	4	3
	B	18	--	--	--
	BA	145	45	1	1

END SEM EXAMINATION JUNE -2024

Q.6.				
(a)	Discuss the term regression and correlation	05	01	02
(b)	Explain with sketch different road marking	05	01	02
(b)	In the research study of maintenance policy for the pavement. The condition state of road was decided based on surface area of pot hole, depressions and undulations, cracks and depth of rutting per kilometer length. The condition survey was carried out for 250 road section and data analyzed. Also, the spot speed study were carried out on these 250 sections, the data analyzed and the average speed estimated. The relation between average speed of vehicle on the road and corrosponding condition state is shown in table below; Develop a regression equation for (i) Determining condition state of pavement from speed (ii) Determining speed of vehicle from condition state.	10	01	03

Condition state	1	2	3	4	5	6
Speed in km/hr	55	48	33	28	22	15

Q.7.				
(a)	Explain the balanced and unbalanced transportation problem with an example	08	01	01
(b)	A company has three plants A, B and C which supply two warehouses D, E, F and G. monthly plan capacity are 1500, 2500, 500 units respectively. Monthly warehouse requirements are 500, 1500, 1500, 1000 units respectively. Unit transportation costs are given in Table -IV. Obtain initial feasible solution by (i) N- W Corner Method. (ii) Least Cost Method	12	01	03

	D	E	F	G	Supply
A	5	8	6	6	1500
B	4	7	7	6	2500
C	8	4	6	6	500
demand	500	1500	1500	1000	

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

END SEMESTER-VI EXAMINATION JUNE 2024

2876/24

Program: T.Y. B.Tech Civil

Course Code: ~~MC-102~~ MC-102

Course Name: Environmental Studies

Duration: 180 Min

Maximum Points: 100

Semester: VI

Instructions:
1. Attempt any five out of seven questions
2. Illustrate answer with neat sketches wherever required.
3. Make suitable assumptions where necessary and state them clearly.

Q.No.	Questions	Points	CO	BL	Mod. No.
Q1					
a	Write a short notes on scope of environmental studies	5	1,3	2	1
b	Define ecosystem. Explain the concept of ecosystem	5	1,2	1	1
c	Write a short notes on multidisciplinary nature of environmental studies	10	2	2	1
Q2					
a	Write a short notes on London smog	5	3	1	1
b	Explain Donora Pennsylvania air pollution episode	5	3	2	1
c	Explain various types of Environmental segments	10	2,3	2	1
Q3					
a	Differentiate between genetic and species diversity	5	1,3	2	2
b	Explain the threats to biodiversity	5	1,3	1	2
c	Describe the importance of biodiversity	10	2	2	2
Q4					
a	Write a short note on primary productivity and its different types in an ecosystem	5	1,3	1	2
b	Explain the concept of green building	5	1,2	1	2
c	Describe the concept of life cycle analysis (LCA) and provide an example	10	3,2	3	2

Q5					
a	Write a short note on the 3 R concept.	5	1,2	1	3
b	Explain the different sources of water and how they are classified	5	3	2	3
c	Classify the different types of water pollutants and explain each in details	10	2	3	4
Q6					
a	What is air pollution and how is it classified?	5	3,1	2	3
b	Write short note on different sources of carbon monoxide (CO) with chemical reaction	5	3,1	1	3
c	Explain greenhouse effect and ozone hole	10	2	2	3
Q7					
a	Explain the concept of acid rain and El Nino effect on environment	5	2,3	2	3
b	Write short note on different sources of Nitrogen Oxide (NO) with chemical reaction	5	3	1	3
c	Describe the different sources of solid waste and how solid waste is managed	10	3	2	4

End Semester Examination

T.Y. B Tech (Civil) 14th June 2024   16/6/24

Sem VI

Program: UG Third Year

Course Code: PC-BT603

Course Name: Foundation Engineering
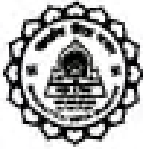
Duration: 3 Hours

Maximum Points: 100

Semester: VI

Notes:

- **Question 1 is compulsory. Attempt any four out of remaining six questions**
- Assume **suitable data** if necessary and **state it clearly**
- Clearly write units everywhere. Points will be deducted in each place units are missing
- Figure on right indicate **maximum points** for the given question, **course outcomes attained**, and **Bloom's Taxonomy Level**

Q.			Points	CO	BL
1	a	Differentiate between shallow and deep foundations	5	2,3	2
	b	What are displacement piles? How are they different from non-displacement piles?	4	3	1,2
	c	Determine the coefficient of lateral earth pressure for at rest condition, active condition and passive condition for $\phi=28°$.	3	1	3
	d	Discuss how a ditch conduit is different from a positive projecting conduit. Illustrate with neat sketches. A flexible ditch conduit of diameter 1.8m is placed in a ditch having with of 2.2m. If the backfill placed above the crown is 8m deep with unit weight of 17.8kN/m³, determine the load on the conduit assuming load coefficient of 2.92.	8	4	2,3
2	a	Determine the net ultimate bearing capacity of a sandy clay deposit over which a strip footing having a width of 2m and embedment depth of 1.8m below the GS is constructed. Triaxial tests have given cohesion = 12kN/m² and friction angle as 25°. The dry unit weight of the soil is 18.1kN/m³ and ground water is noted at a depth of 6m below GS. Assume general shear failure conditions and use IS6403 recommendations (see Table 1, Page 4). Also calculate the net ultimate bearing capacity if GWT rises to the base of foundation and saturated unit weight is 20.2kN/m³.	10	2	3,4
	b	A 3m high retaining wall has a vertical back and horizontal granular backfill. Determine the passive resistance if $\phi=30°$ and unit weight of soil is 15.7kN/m³. If the wall friction angle is considered to be 15°, determine the new passive resistance and % change in the value. $$k_p = \left(\frac{sec\theta cos(\phi + \theta)}{\sqrt{cos(\theta - \delta)} - \sqrt{\frac{sin(\phi + \delta)sin(\phi + \beta)}{cos(\beta - \theta)}}}\right)^2$$	10	1	3

3	a	Estimate the safe load carrying capacity (in t) of a 15m long, 500mm diameter pile driven in clay having following properties: 0-2.5m – c_u = 0.4t/m², α = 0.84 2.5-10m – c_u = 1.5t/m², α = 0.63 Below 10m – c_u = 2.8t/m², α = 0.5	10	3	3,4
	b	A contractor at a site is refusing to put adequate drainage behind a retaining wall. Convince him why an appropriate drainage system is necessary.	5	1	5
	c	Discuss the mechanism of load transfer in a CPRF. State advantages of CPRF over pile foundations.	5	4	2,3
4	a	An open cut was made to a depth of 10.5m in sand having ϕ=36°. Before and during excavation, ground water was lowered to a considerable depth. The struts are placed at 2.6m c/c along the length of cut. Draw the apparent pressure diagram and determine the centre of pressure.	10	4	3,4
	b	Discuss the limitations of a plate load test	5	2	2
	c	Differentiate between active and passive lateral earth pressures	5	1	2
5	a	For the cantilever retaining wall shown in Figure 1 calculate the maximum and minimum pressure at the base assuming that the wall moves away from the backfill and the wall back is smooth. If the allowable capacity below base is 200 kN/m², is it safe? Also list other checks of safety you will perform.	15	1	3,4

Within question 4a:

Location of strut below GL (m)	Measured Load (kN)
0.9	30
3.6	44
7.2	53
9.6	26

80 kN/m²

Granular backfill

ϕ = 36°, γ_{soil} = 17.8 kN/m³

γ_{conc} = 25 kN/m³

Interface friction between foundation and soil: 24°

5m

1m   2m   0.5m

3.5m

Figure 1

	b	Calculate the group capacity of a 4x5 group with diameter 400mm, length of 18m, placed 2.8d centre to centre and having single pile capacity of 150kN and placed in clay deposit.	5	3	3,4

6	a	Design a combined footing supporting two columns C_1 and C_2 carrying 400kN and 750kN, respectively and having a size of 30cm x 30cm and 40cm x 40cm, respectively. The columns are spaced 3m centre to centre and the allowable soil pressure is 100kN/m^2. The footing should not extend beyond column C_1 as it is along the property boundary. Show the arrangement and dimensions of the footing	10	2	3,4
	b	What is negative skin friction? Discuss how it can be calculated and steps that can be taken to minimise it.	5	3	2
	c	A retaining wall 4 m high retains soil having the following properties: cohesion = 14kN/m^2, friction angle 30°, unit weight 16.9kN/m^3. Assuming cracks occur, determine the active thrust exerted on the wall.	5	1	3,4
7	a	Determine the consolidation settlement of a pile group of 4x4 piles with length 15m constructed in 16m thick clay deposit having γ_{sat} = 18 kN/m^3, e_0=0.97 and C_c=0.24. This clay is underlain by impermeable rock. The pile group carries a load of 2000kN and the group dimensions are 3.3m x 2.2m.	10	3	3,4
	b	A square footing has to support 4640kN load with factor of safety 3. If the footing is embedded to 3m depth and GWT is deep below, design the footing size if soil has unit weight of 19kN/m^3, c=15 kPa and friction angle of 30°. Use IS6403 recommendations for shape factor.	10	2	3,4

Table 1: IS 6403 – 1981 relevant clauses

IS 6403 : 1981

TABLE 1 BEARING CAPACITY FACTORS
(Clause 5.1.1)

BEARING CAPACITY FACTORS

ϕ (Degrees)	N_c	N_q	$N\gamma$
0	5·14	1·00	0·00
5	6·49	1·57	0·45
10	8·35	2·47	1·22
15	10·98	5·94	2·65
20	14·83	6·40	5·39
25	20·72	10·66	10·88
30	30·14	18·40	22·40
35	46·12	33·30	48·03
40	75·31	64·20	109·41
45	138·88	134·88	271·76
50	266·89	319·07	762·89

NOTE — For obtaining values of N'_c, N'_q and $N'\gamma$, calculate $\phi' = \tan^{-1}$ (0·67 tan ϕ). Read N_c, N_q and $N\gamma$, from the Table corresponding to the value of ϕ' instead of ϕ which are values of N'_c, N'_q, $N'\gamma$ respectively.

5.1.2 The ultimate net bearing capacity obtained in 5.1.1 for strip footing shall be modified to take into account, the shape of the footing, inclination of loading, depth of embedment and effect of water table. The modified bearing capacity formulæ are given as under:

a) In case of general shear failure q_s
$$\} = cN_c s_c d_c i_c + q(N_q - 1) s_q d_q i_q + \tfrac{1}{2} B\gamma N\gamma s_\gamma d_\gamma i_\gamma W'$$

b) In case of local shear failure q'_s
$$\} = \tfrac{2}{3} cN'_c s_c d_c i_c + q(N'_q - 1) s_q d_q i_q + \tfrac{1}{2} B\gamma N'\gamma s_\gamma d_\gamma i_\gamma W'$$

5.1.2.1 The shape factors shall be as given in Table 2.

TABLE 2 SHAPE FACTORS

Sl. No.	Shape of Base	SHAPE FACTOR		
		s_c	s_q	$s\gamma$
i)	Continuous strip	1·00	1·00	1·00
ii)	Rectangle	1+0·2 B/L	1+0·2 B/L	1−0·4 B/L
iii)	Square	1·3	1·2	0·8
iv)	Circle	1·3	1·2	0·6

Use B as the diameter in the bearing capacity formula.