B. Tech. Civil - Sem VII

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

Munshi Nagar, Andheri (West), Mumbai – 400058.
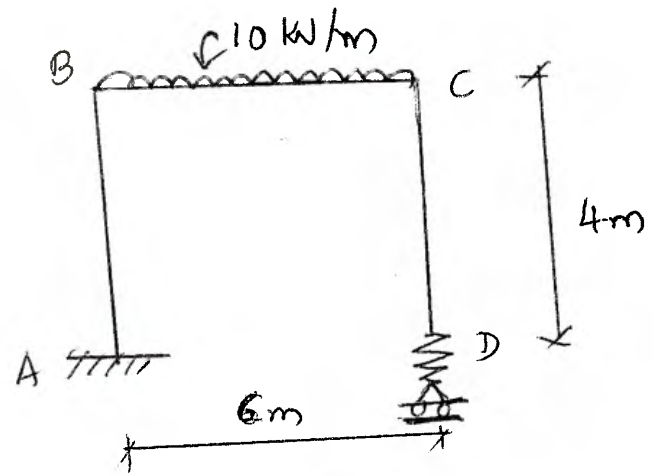
End Semester Exam

May 2017

Max. Marks: 100

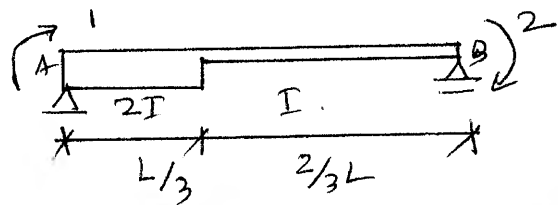Class: B.Tech. Semester: VII

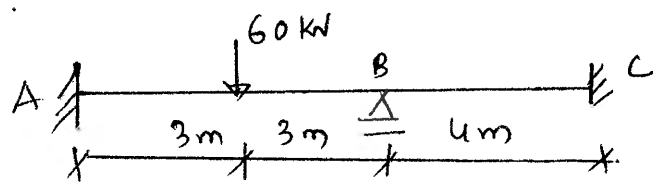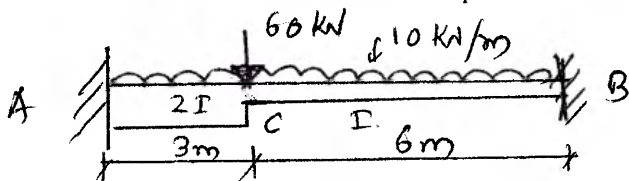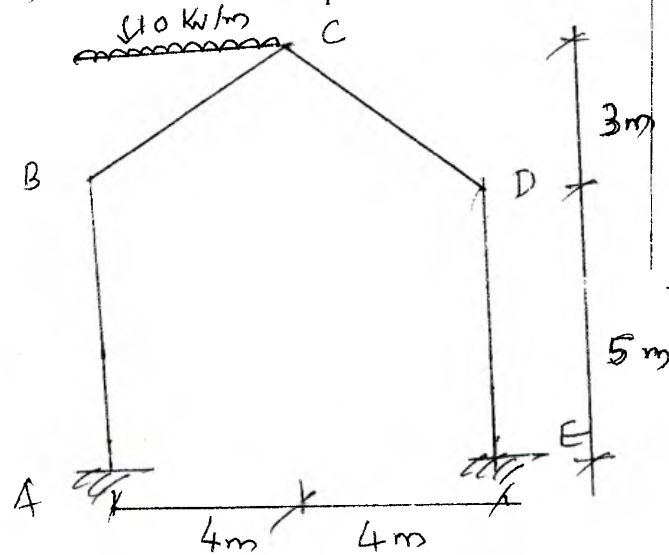Name of the Course: Advanced Structural Analysis

Duration: 3 Hours

Program: Civil Engineering

Course Code : BCT406

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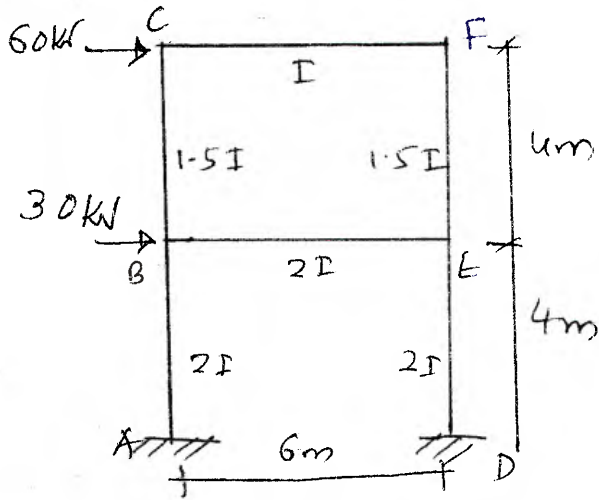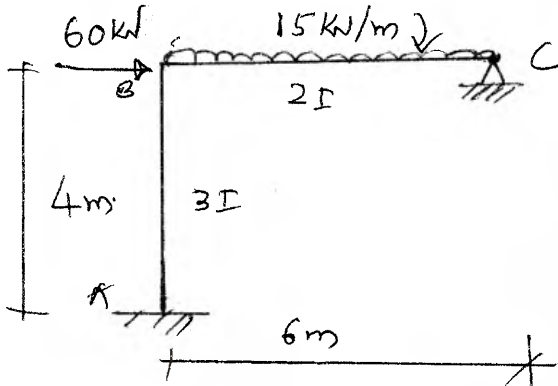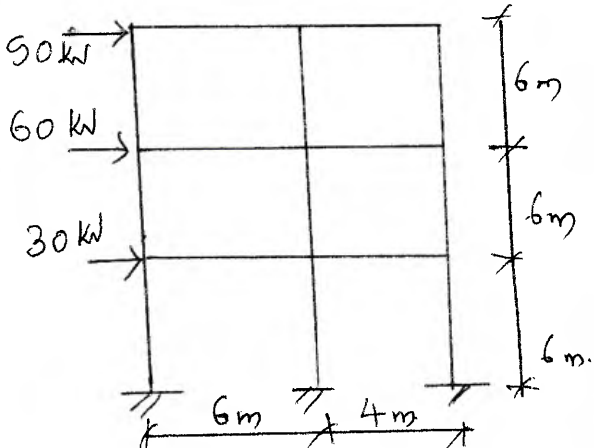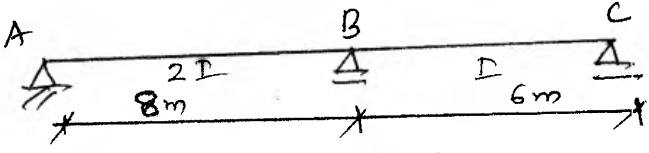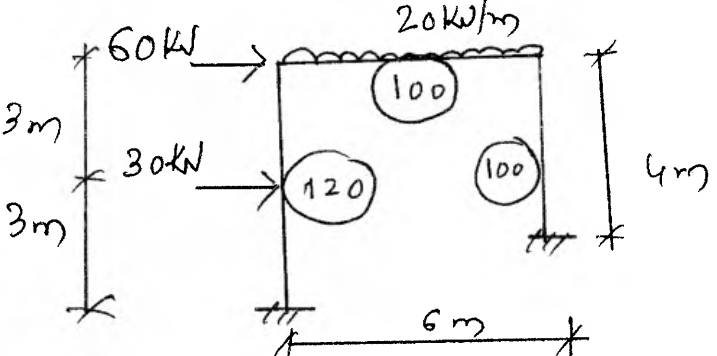
Instructions:
- Attempt any FIVE questions out of SEVEN questions.
- Answers to all sub questions should be grouped together.
- Figures to the right indicate full marks.
- Assume suitable data if necessary and state the same clearly.

Question No		Max. Marks	Course Outcome No.	Module No.
Q1 (a)	Define and explain the meaning of symmetric structure with the help of example. Also state the advantage of Symmetric structure.	3	2	3
Q1(b)	Analyse the rigid jointed frame shown in Figure by flexibility method and draw BMD and deflected shape. Note that D is simply supported on elastic foundation, which is free to move horizontally and also free to rotate. **EI = 1 X 10⁴ KN-m² and Kₛ = 1000 KN/m.**	8	2	4

$EI = 1 \times 10^4$ KN-m² and $K_s = 1000$ KN/m.

Q1 (c).	For the non-prismatic beam element shown in figure calculate the stiffness coefficients K_{11} and K_{21}. Also calculate the COF from A to B	9	2	4
Q2 (a)	Analyse the beam shown in figure by Matrix Stiffness Method. Note that support 'B' settles down by 10 mm. EI== 10,000 KN/m^2.	8	1,4	2
Q2 (b)	Using Column Analogy Method, analyse the beam shown in figure and draw BMD and Deflected shape.	12	2	4
Q3(a)	Derive the modified stiffness and carry over factor for a symmetric beam (axis of symmetry passing through center of beam) subjected to Anti- symmetric loads	2	2	3
Q3 (b)	Analyse the frame shown in figure by Elastic Centre Method and draw BMD, SFD and deflected shape.	18	2	4

Q4	Analyse the frame shown in figure by Modified Moment Distribution Method and draw SFD, BMD & deflected shape.	20	2	3
Q5 (a)	Analyse rigid jointed plane frame shown in figure by Matrix Stiffness Method and draw BMD and deflected shape.	08	1,4	2
Q5(b)	Analyse the frame shown in figure by _Cantilever_ Method and draw SFD, BMD and deflected shape.	12	2	6

			4	3	5
Q6(a)	(i) State and prove Muller Breslau's Principle		4	3	5
Q6(b)	For the beam shown in figure, construct the ILD for: (i) Reaction at 'C' R_c (ii) Moment at 'B' M_B Show the ordinates of ILD at 2m intervals		16	3	5
Q7(a)	Using plastic analysis, determine the load factor for the frame loaded as shown in figure. The Plastic Moment capacity of each member is indicated in the figure. 		16	2	7
Q7b)	(i) Explain the need of approximate methods of Analysis (ii) State the various approximate methods of analysis for vertical and lateral loads.		2 2	2 2	5 5

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END SEM EXAMINATION
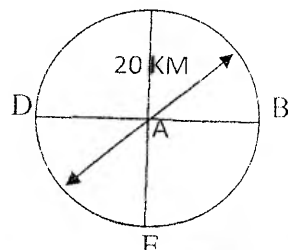
NOVEMEBR 2017

Program: Civil Engineering
B. Tech.
Course code: BTC 403
Name of the Course: Water Resources Engineering
Semester: VII
Instructions:

Duration: 3 hr
Maximum Marks: 100

Master file,

1. **Question number one is compulsory.**
2. **Out of question no. 2 to question no.7 attempt any four questions.**
3. Neat diagrams must be drawn wherever necessary.
4. Figures to the right side indicate full marks.
5. Assume Suitable data if necessary and state it clearly

Que. No.		Max. Marks	Course Outcome Number	Module No.
Q1(a)	The left branch canal of main canal running for very long distance, carrying a discharge of 20 cumecs has culturable commanded area of 20000Ha. The intensity of irrigation of rabi crop is 80% and base period is 120 days. The right branch of the same main canal carrying discharge of 8 cumecs has culturable commanded area of 12000 Ha. The intensity of irrigation of Rabi crop is 50% and base period is 120 days. Compare the efficiencies of the two canal systems.	5	CO3	2
(b)	Discuss Irrigation Systems	5	CO1	2
(c)	Five rain gauge stations A,B,C,D &E are located on a circular shaped basin of diameter 20 km as shown on figure. Compute the mean areal rainfall over the basin using Thiessen Polygon Method if the rainfall at station A,B,C,D,&E are 100 cm, 90 cm, 110 cm,120cm & 80cm respectively	5	CO2	3
(d)	Elaborate the design of Irrigation channel by Kennedy's Method.	5	CO4	7
Q2 (a)	Compute the average discharge requirements and peak	6	CO3	2

demand for the data given below in the table

Crop	Area under Crop (Ha)	Total Depth (cm)	Base Period (in Days)	Average duty (Ha/Cumees)
Wheat	5000	37.5	140	3225.6
Rice	2500	120	120	864

For Wheat- Kor Depth=13.5 cm and Kor period=4 weeks
For Rice- Kor Depth=19 cm and Kor period=2.5 weeks

(b)	Your field is in an area, where water-logging is predominant phenomenon. Suggest suitable remedial measures to solve the problem of water-logging.	7	CO1	2
(c)	Explain the types of precipitation.	7	CO2	3
Q3 (a)	A storm over a catchment of area 5 km² had duration of 14 hours. The mass curve of rainfall of the storm is as follows:	10	CO2	3

Time from Start of Storm (hrs)	0	2	4	6	8	10	12	14
Accumulated Rainfall (cm)	0	0.6	2.8	5.2	6.7	7.5	9.2	9.6

If ϕ index for the catchment is 0.4cm/hr. Determine the effective rainfall hyetograph and volume of direct runoff from the catchment due to storm.

(b)	Describe recuperation test for an open well	5		4
(c)	Discuss the factors affecting duty.	5	CO2	2
Q4 (a)	A tube well penetrates fully in a 8.5m thick water bearing stratum. The coefficient of permeability of the stratum is 0.006m/sec. The diameter of the tube well is 30 cm and it is to be worked under drawdown of 5.5m at the face of well. Determine the well discharge if the radius of the well is increased to 20 cm, What will be the increase in its discharge. Assume the radius of the drawdown as 250m.	7	CO4	4
(b)	Discuss the methods of control of sedimentation in a reservoir.	6	CO4	5
(c)	Explain the advantages and disadvantages of Buttress dam.	7	CO4	6
Q5 (a)	A masonry dam 10 m high is trapezoidal in section with a top width of 1 m and bottom width of 8.25m. Face exposed to water has a batter of 1:10 Calculate: i. FOS against sliding ii. FOS against overturning iii. Shear Friction Factor (SFF) Is it safe in sliding and overturning, assuming μ=0.75, Unit weight of masonry=2240kg/m³. Permissible shear stress of joint=14kg/cm² Neglect uplift pressure. Based on the results give your remark.	12	CO4	6
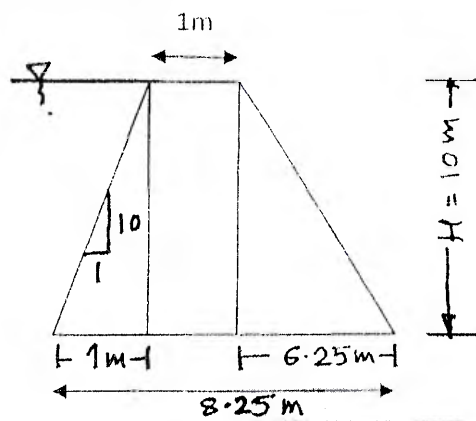
(b)	Discuss Tipping Bucket Type rain gauge.	4	CO2	3
(c)	Discuss control of seepage through earthen dam.	4	CO4	6
Q6 (a)	Derive expression for Phreatic line in a dam with horizontal drainage Filter in case of earth dam. Also derive expression for discharge.	10	CO4	6
(b)	Define spillway and discuss various types of spillways.	10		6
Q7 (a)	Design a regime channel to carry a discharge of 40cumecs by Lacey's theory. Assume the side slope to be 1:1. The average size of the bed material may be taken as 0.8mm.	9	CO4	7
(b)	Describe various types of cross drainage works	8	CO4	7
(c)	Explain the terms firm yield, average yield and secondary yield.	3	CO2	5

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End Semester EXAM

Q. P. Code:
Max. Marks: 100   Duration: 3 Hrs
Class: B.Tech   Semester: VII   Program: Civil Engineering
Name of the Course: Risk & Value Mangement   Course Code : BTC 413

Master file.

Instructions:
1. **Q.1 is compulsory & Attempt any four out of six.**
2. **Make suitable assumptions where necessary and state them clearly.**

Questio n No		Max. Marks	Course Outcome Number	Module no.
Q.1	Solve any Four 1) Apply the Value engineering in the context of Building Project 2) Break even analysis 3) Enlist & explain the steps of computation of life cycle costing. 4) Value management & its nature. 5) Risk Handling options in Risk Management 6) Factors impacting energy consumptions in building	20	1-3	1-7
Q.2	A) Define; Risk & its types in Construction industry. Also explain any two ways for risk mitigation/reducing strategies in above industry	06		
	B) Define: Risk Management. Also explain various steps involved in risk management.	08	01	1-2
	C) Explain factors which help in determining risk impact during construction phase. **(any twelve)**	06		
Q.3	A) "Risk register is not only a record of events but also workbook of all risk mitigation strategies" Justify above statement while discussing the concept, significance & important components of it.	08		
	B) According to ISO 27001, "Residual risk is the risk remaining after risk treatment". Briefly explain above statement along with its relation to residual risk management.	06		

	C) Explain following terms
	  1) Risk Appetite 2) Risk Exposure
	Find out total risk exposure for the following events
	  i) Failure to complete project on time (probability is 40% for two weeks delay & penalty is 2 Lakh/week)
	  ii) New regulatory poke (probability is 20% & redesigning cost is 1 Lakh)
	  iii) Material shortage for vendor (probability is 40% & additional expense is 1Lakh)
		06	01	03

Q.4	A) A large steel manufacturing company has three options with regard to production: 1) produce commercially 2) build pilot plant 3) stop producing steel. The management has estimated that their pilot plant if built, has 0.8 chance of high yield & 0.2 chance of low yield. If pilot plant does show high yield, management assigns a probability of 0.75 that the commercial plant will also have high yield. If the pilot plant shows a low yield, there is only 0.1 chance that commercial plant will show high yield. Finally management best assessment of the yield on a commercial size plant without building a pilot plant first has a 0.6 chance of high yield. A pilot plant will cost Rs. 3, 00,000/- . The profit earned under high & low yield conditions are Rs. 1,20,00,000/- and - Rs 12,00,000 respectively. Find the optimum decision for company	08	1,2	02

B) What is Net Present Value & Payback period? Calculate NPV for following table $[i = 10\%]$ — 06

Year	0	1	2	3	4	5
	100000	20000	20000	20000	40000	50000

C) Define Social Cost benefit analysis.
Based on tabulated information which project should be selected for satisfying minimum required rate of return, — 06

	Project P	Project Q
Investments (Rs.)	60000/-	78000/-
Expected life (in Years)	04	05
Net earnings Year wise		
1st	6000	7200
2nd	4500	7200
3rd	4500	6300
4th	3000	3200
5th		3000
	18000	26900

Q.5	A) Define Value Engineering. Also explain its importance.	08	02	4-5
	B) Explain various value engineering job plans phases stating importance of each.	08		
	C) How an enterprise can achieve excellence using value engineering? State its characteristics.	04		

Q.6	A) Explain the following terms; 1) Value 2) Esteem Value 3) Exchange value 4) Cost Value 5) Use Value	05	02	4-5
	B) How to add value to product or service?	07		
	C) Highlight some issues in building value in a construction project.	08		

Q.7	A) Explain the concept of Life Cycle Costing along with its advantages & disadvantages. Also explain approaches towards life cycle costing.	08	03	07
	B) Briefly explain various types of costs involved in life cycle costing of project.	04		
	C) With the help of discounted cash formulas, help Mr. Suraj in following conditions	08		

1) He required Rs. 25,000 for his son's education about 12 years from now. If bank is ready to give him 10 % annual interest, how much amount he has to keep in his account in single deposit?

2) If he is obligated to pay his son's college fees Rs.8000 a year for 5 years. What single amount should be deposited in his account in order to have enough money for the payments? (10 % annual interest)

3) He has taken a mortgage of Rs.1, 00,000/- at 10% annual interest for 20 years. What is the constant annual payment required to repay the loan?

4) He opened a saving account and adding Rs.2000/year for next 5 years. How much he will have after 5 years? (10 % annual interest).

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End Semester Exam
November 2017

Master file.

Max. Marks: 100	Duration: 03 hours
Class: B.Tech. Semester: VII	Program: Civil Engineering
Course Code: BTC402 Course – Construction Engineering	

Instructions:

- Q.1 is compulsory.
- Attempt **any four** out of remaining six questions.
- Assume suitable data if required and state it in the answer sheet.
- Answer each question on a new sheet or page.
- Figures to the right indicate full marks assigned to the question.

Q.no.		Max. Marks	Course Outcome	Module No.
1	Answer (any five): 04 marks each			1 to 7
	1. Enlist factors (atleast 4) governing selection of a earth moving equipment		CO1	
	2. Differentiate (atleast 4 points) single acting and double acting pile driving hammer		CO1	
	3. Explain a) Depreciation b) Scrap Value		CO1	
	4. Enlist the methods (atleast 4) of tunneling in a) soft soils and b) hard rocks	20	CO2	
	5. Differentiate (atleast 4 points) between stone column and sand drains		CO3	
	6. Give applications (atleast 4) of shotcrete.			
	7. Enlist different types (atleast 4) of cladding materials		CO1	
2.a	Calculate the hourly OWNERSHIP COST for a Truck-mounted crane with following information: Truck-mounted crane 150 ton w/260'; Lattice boom; Equipment horsepower: 207; carrier horsepower 430 List price = INR 11, 97,389 Discount: 7.5% Sales tax = 8.7% Estimated annual use in hours - 1590 h Total expected use in hours = 20,000 h Average conditions of use Tires front = INR 35200 Tires drive = INR 70400 Fuel cost = INR 60 per litre	07	CO1	1,3

Final year B.Tech. Civil. Sem VII
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November 2017

	Taxes, insurance, and storage – 3.75% Salvage value = 20% Investment, taxes, insurance and storage – 13% Repair and maintenance = 37% depreciation cost Tire repair cost = 16% of straight-line depreciated tire cost			2
2.b	A Cat D631E Series II wheel tractor scraper assisted with a D9R bulldozer is to be used to move dirt about 4200' to build a detention pond at the entry of subdivision. The D9R has ripped the soil in the area to be excavated about 18" deep. The D9 is to push the scraper until it is out of the hole. Once full, the scraper's average haul speed will be around 10 mph (miles per hour). The return route is about 4400' and the average return speed will be around 14 mph. The rated heaped capacity of the D631 is 31lcy. The estimated load time according to the performance manual is 0.6 min. The estimated dump time is about 0.7min. Calculate the work hour productivity of the scraper, if the operator works 50 min per 60-min hour. Also, calculate the number of scrapers that the pusher (D9R dozer) can support. *Hint:* *Work hour production = (Rated Capacity x operational efficiency) / cycle time* *Pusher cycle time – 1.4Ls + 0.25min. Ls is the load time of the scraper*	06		2
2.c	With a neat and labelled sketch, explain the components of a scraper	07		2
				1,3
3.a	Write a note on 'CONTROLLED BLASTING'. Give a detailed discussion on ROTARY AND PERCUSSIVE DRILLING.	10		
3.b	A Volvo G740B motor grader with a 14' blade is to be used to move earth on a 66' x 9800' long road base area. The effective grading width is 12'. The average speed of the grader will be 3 miles per hour (mph). Two passes will be required to reach the desired smoothness. Calculate the work hour productivity if the operator works for 50min per 60-min hour. Also, calculate the time required (hours) to grade the road base area.	03	CO1	2
3.c	Describe CRUSHER with its types and state the factors affecting the output of the crusher	07		2

4.a	Draw a neat longitudinal c/s of a TUNNEL BORING MACHINE (TBM) and in short explain the working of TBM.	10	CO2	4
4.b	A power-shift crawler tractor has a rated blade capacity of 7.65 m3 (loose). The dozer is excavating loose common earth and pushing it a distance of 61 m with a dozing speed of 4 Kmph. Maximum reverse speed of the dozer in third range is 8 Kmph. Calculate the production capacity per hour of the dozer. (See Table 4b)	04	CO1	2
4.c	Sketch and label the components of a typical belt conveyor system (BCS) and explain the function of Idlers and Feeder.	06	CO1	2
5.a	Enlist the construction equipment to be used for the construction of DIAPHRAGM WALL (DW). With a neat sketch explain the steps for the construction of DW.	10	CO3	5
5.b	A Case 750K bulldozer with a 8' blade is to be used to excavate and push fairly loose dirt. According to the soils report, the dirt to be moved has a 23% swell factor. When the dozer is hauled to the site a couple of blade loads are excavated to estimate a typical load. The average H = 4', the average load width is 6', and the load length is 9'. Actually observing and recording times for individual cycles and then finding the average observed cycle time is probably the most accurate way to estimate a typical production cycle time. The load time suggested by the manufacturer is about 0.08 min. Once the blade goes through the cut, the haul push is about 200' with an average speed of about 2.6 mph. Backtrack distance is about 240' and the dozer will travel at a speed of about 3.2 mph. Once back to the hole, the dozer takes about 0.06 min to reposition. The Case dealer suggests an O&O cost of about INR 4000/h. Your operator costs about INR 1500/h with contractor outlay. Estimate: a) Amount of dirt (lcy) moved in one production cycle b) Amount of dirt (bcy) moved in one production cycle c) Cycle time for one production cycle	10	CO1	2

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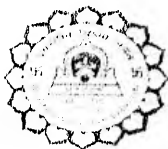(A Government Aided Autonomous Institute)
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End Semester Exam
November 2017

Chart 7b -2

(b)

Source: Caterpillar Tractor

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Table 7b-3

JOB CONDITION CORRECTION FACTORS

	TRACK-TYPE TRACTOR	WHEEL-TYPE TRACTOR
OPERATOR —		
Excellent	1.00	1.00
Average	0.75	0.60
Poor	0.60	0.50
MATERIAL —		
Loose stockpile	1.20	1.20
Hard to cut; frozen —		
with tilt cylinder	0.80	0.75
without tilt cylinder	0.70	—
cable controlled blade	0.60	—
Hard to drift, "dead" (dry, non-cohesive material) or very sticky material	0.80	0.80
Rock, ripped or blasted	0.60-0.80	—
SLOT DOZING	1.20	1.20
SIDE BY SIDE DOZING	1.15-1.25	1.15-1.25
VISIBILITY —		
Dust, rain, snow, fog or darkness	0.80	0.70
JOB EFFICIENCY —		
50 min/hr	0.84	0.84
40 min/hr	0.67	0.67
DIRECT DRIVE TRANSMISSION		
(0.1 min. fixed time)	0.80	—
BULLDOZER*		
Angling (A) blade	0.50-0.75	—
Cushioned (C) blade	0.50-0.75	0.50-0.75
D5 narrow gauge	0.90	—
Light material U-blade (coal)	1.20	1.20
GRADES — See following graph.		

*Note Angling blades and cushion blades are not considered production dozing tools. Depending on job conditions, the A-blade and C-blade will average 50-75% of straight blade production.

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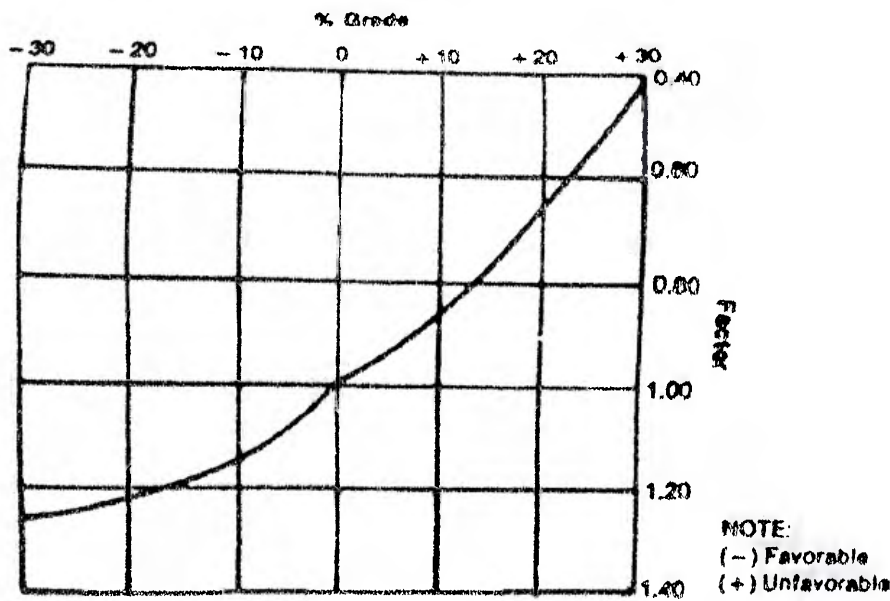Munshi Nagar, Andheri (West), Mumbai – 400058.
END SEM

Max. Marks: 100
Duration: 3 hr
Class: Btech
Name of the course: Limit State Method for RC Structures

Q.P. Code: BTC 401
Course Code : BTC 401
Sem-VII
Program: Civil Engineering

Master file.

Instructions:
1) Question No. 1 is compulsory.
2) Attempt any four from the remaining questions.
3) Draw reinforcement details wherever necessary.
4) Use of IS 456:2000 is permitted.

Question No			Maximum Marks	Course Outcome Number	Module Number
1	a)	State and explain the assumptions made in LIMIT State of collapse(Flexure).Also draw stress and strain diagram across the section.	05	1	2
	b)	What do you mean by Limit State. Explain various limit states.	05	1	2
	c)	When it is required to design doubly reinforced beam section. Also draw various forms of shear reinforcement provided in beam.	05	1,2	3
	d)	Derive design stress block parameters for singly RC sections for LSM of design.	05	1,2	2
2	a)	RC section 230mmx550mm depth overall and reinforced with 4-20mm dia is used as simply supported beam over an effective span of 6m. Determine the maximum udl beam can carry safely.Use M 25 and Fe-500	10	1,2	3
	b)	A rectangular beam 400mm x700mm effective depth is reinforced with 6 bars of 20mm dia in tension zone. The beam is subjected to udl of 50kN/m over span of 8m.Design shear reinforcement if two bars are bent up at 45" near end of each support.Use M30 and Fe 500	10	1,2	3
3)	a)	A RCC beam reinforced on tension side is 230mm wide with an effective depth of 500mm.It is reinforced with 4 bars of 20mm diameter.Calculate the ultimate moment of resistance using Ultimate Load Method.Take σ_{cu} 20N/mm^2 and	08	1	1

		$\sigma_{sy}=425N/mm^2$			
	b)	An isolated TEE beam section having an effective depth of 580mm ,flange width of 12400mm ,rib width of 300mm ,slab depth of 120mm comprises of 8 bars of 20mm diameter. Calculate moment of resistance of beam. Use M-20and Fe-415.	12	1,2	4
4)	a)	Draw Pu-Mu curve for column of given proportions. Explain Region II and III of the curve in detail.	10	1,2	6
	b)	Design short helically reinforced column to resist service load of 1400kN.Use M30 and Fe 415.Draw reinforcement details.	10	1,2	6
5)	a)	Design a RC slab for an interior panel of a **passage** of a residential building. The size of panel is 4mx 4m.Using appropriate loading , design the slab panel. Give appropriate checks. Use M35 and Fe 415.	16	1,2	5
	b)	Explain in brief Whitney's theory	04	1,2	1
6)	a)	A rectangular column of dimension 300mmx450mm is subjected to an ultimate axial load of 1000kN.Design isolated footing for column assuming SBC as 250kN/m^2 Use M30 and Fe 415	15	1,2	7
	b)	Write a short note on various types of footing under various conditions showing sketches.	05	1,2	7
7)	a)	A RCC beam 3000mm x450mm effective is subjected to an axial moment of resistance of 224kN-m.Find out the steel required using Ultimate Load Method. Take $\sigma_{cu}=20N/mm^2$ and $\sigma_{sy}=425N/mm^2$.	10	1	1
	b)	Design one way slab panel of RCC residential building having dimensions 3mx6.5m. Using LL=2kN/m2 and FF=1.5kN/m2 , design the slab panel. Give appropriate checks. Use M30 and Fe 415	10	1,2	5

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Sardar Patel College of Engineering

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Munshi Nagar, Andheri (West), Mumbai – 400058

END SEMESTER EXAMINATION
November- 2017

Date: 22/11/17

Program: B.Tech. Civil Engineering

Duration: 3hr

Course code: BTC407

Maximum Marks: 100

Name of the Course: Advanced Computational Techniques

Semester: VII

Note: Solve any Five

Assume the data wherever necessary and mention it clearly.

Master file.

Q. No.		Mark	CO	M.N
1a	The manager of oil refinery must decide on the optimal mix of two possible blending processes of which the inputs and outputs per production run is as follow: Process / Input Unit / Output Unit table below The maximum amount available of crudes A and B are 200units and 150 units respectively. Market requirement shows that atleast 100 units of gasoline X and 80units of gasoline Y must pe produced. The profit per production run for process 1 and process 2 are Rs 300/- and Rs 400/- respectively. Solve the LP problem by the graphical method for maximization of profit.	08	3	6

Table within 1a:

Process	Input Unit		Output Unit	
Units	Grade A	Grade B	Gasoline X	Gasoline Y
1	5	3	5	8
2	4	5	4	4

Q. No.		Mark	CO	M.N
1b	Solve the following problem by simplex method. Maximize $Z= 6x_1+ 8x_2$ Subjected to the constraint $50x_1+ 10x_2\leq 60$ $4x_1 + 4x_2\leq 40$ $x_1, x_2, \geq 0$	12	3	6
2a	The construction company is planning to sale its flat using different advertising strategy S1, S2 and S3. The marketing department of the company worked out the payoffs in terms of net profit for each strategy of three events of expected sales. This is represented in following table. (table below) State which strategy should the concerned executive choose on the basis of i) Maximin criterion ii) Maximax criterion iii) Equal likely decision (Laplace) criterion iv) Opportunity loss criterion v)	08	2	5

Table within 2a:

Strategies	State of Nature for sale		
	High	Medium	Low
S1	7,00,000	3,00,000	1,50,000
S2	5,00,000	4,50,000	0
S3	3,00,000	3,00,000	3,00,000

Q. No.		Mark	CO	M.N
2b	Charlotte Watson, the manager of a construction company, has the opportunity to buy a fixed quantity of flat in Uran region of which she can then offer for sale to clients. The decision to buy the flat and offer it for sale would involve a fixed cost of Rs.20,00,000. The number of flat that will be sold is uncertain, but Charlotte's prior beliefs are expressed as follows.	12	2	5

Sales	Probability	Profit
Poor	0.2	12,00,000
Moderate	0.5	25,00,000
Good	0.3	40,00,000

For an additional fixed cost of Rs. 3,00,000, market research can be conducted to aid the decision– making process. The outcome of the market research can be either positive or negative, with probabilities 0.58 and 0.42, respectively. Knowing the outcome of the market research changes the probabilities for the main sales project as follows:

Market Research	Main Sales Probabilities		
	Poor	Moderate	Good
Positive	0.15	0.45	0.4
Negative	0.6	0.35	0.05

Charlotte will make decisions based on expected monetary value. (a) Draw a decision tree for this problem. (b) Use expected monetary value to determine the optimal course of action for Charlotte.

3a	The average number of collisions occurring in a week during the summer months at a particular intersection is 2.00. Assume that the requirements of the Poisson distribution are satisfied. a) What is the probability of no collisions in any particular week? b) What is the probability that there will be exactly one collision in a week? c) What is the probability of exactly two collisions in a week? d) What is the probability of finding not more than two collisions in a week?	08	1	1
3b	A small hotel has rooms on only four floors, with four smoke detectors on each floor. Because of improper maintenance, the probability that any one detector is functioning is only 0.55. The probabilities that smoke detectors are functioning are randomly and independently distributed. a) What is the probability that exactly one smoke detector is working on the top floor? b) What is the probability that there will be at least 15 functioning smoke detectors in the hotel at any one time? c) Probability that at least one detector is working.	06	1	1
3c	In a factory which produces concrete block. Machine A, B and C produce 25%, 35% and 40% of the block of their output 5%,4% and 2% are defective. A block is drawn at random from the production and is found to be defective. i)What is probability that it is casted from machine A,B,C ii) Probability that is casted from Machine A or B.	06	1	1

4a	An AAC Block manufacturing company uses a machine to cast block. The machine is designed to make 475 blocks. The contents vary according to a normal distribution with a mean of 473 blocks and standard deviation of 3 blocks.
	   a) What is the distribution, mean, and standard error of the sample mean of six randomly selected blocks?
	   b) What sample size should be taken in order to estimate the mean of block casted within plus minus 5 margin error @ 95% confidence level.
		04	1	2

4b	The mean yield of one acre plot is 662kgs and the standard deviation is of 32kgs. Assuming Normal distribution how many acre plot in a batch of 10,000 plots would expect yield a) Above 700kgs and b) Below 650kgs	04	1	2
				2
4c	Define sampling and state the methods of sampling in brief with examples	12	1	

5a	In a 2-week study of the productivity of workers, the following data were obtained on the total number of acceptable pieces which 100 workers produced.										12	1	1

21	35	41	47	51	55	60	64	70	76
22	35	42	47	52	55	60	65	70	77
26	36	43	48	52	56	60	65	72	78
28	36	43	48	52	56	61	65	73	79
32	37	44	49	53	56	61	67	73	80
33	38	45	50	53	57	61	67	74	82
34	39	45	50	53	57	62	68	74	82
34	40	45	50	54	58	62	68	74	84
35	40	45	51	54	59	63	68	75	85
35	41	46	51	55	59	63	69	76	88

5a

Group the above data into suitable distribution classes and Find mean, median, mode, 3rd quartile, 4th decile and 78th percentile for the given productivity.
Plot mean median mode and discuss the type of graph from position of the mean median mode.

5b	Briefly explain method of collection of data and explain use of different type of graph for presentation of data.	08	1	1
6a	Define genetic algorithm and discuss its application in civil industry.	08	2	7
6b	From the following data examine whether input of oil and output of electricity can said to be correlated, draw the scatter diagram for respective.	12	3	4

Input Oil	6.9	8.2	7.8	4.8	9.6	8.0	7.7
Output Electricity	1.9	3.5	6.5	1.3	5.5	3.5	2.2

Also find the equation of line for above relation using least square method.

7a	The mean lifetime of a sample of 400 fluorescent light tube produce by a company is found to be 1570hrs with a standard deviation of 150 hours. Test the hypothesis that the mean lifetime of bulb produced by the company is 1600 hours against the alternative hypothesis that it is greater than 1600 hours @ 5% level of significance. Also explain two tail test and one tail test of testing hypothesis.	08	2	3
7b	A manufacturer wants to test the hypothesis that the mean lifetime of two brands of machine used for excavation are equal. The lifetime is measured by the no.of operating hours between the overhauls. A random sample of 15 machines of both brands each gives the following details.	12	2	3

Brand X	1050	1150	850	800	1000	1350	1100	1300	1450
	900	1200	1250	1550	825	650			
Brand Y	1170	970	880	1410	700	775	940	1650	950
	1190	600	1600	975	450	1290			

Using U-Test will you conclude that lifetime of two brands is equal.

Final year B.Tech. Civil. sem VII

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)
Munshi Nagar Andheri (W) Mumbai 400058
End Semester Exam
Nov-Dec 2017

Max. Marks: **100**

Class: **B. Tech**

Name of the Course: **Environmental Engineering II**

Course Code: **BTC 404**

Duration: **3 Hrs**

Semester: **VII**

Program: **B. Tech Civil**

Master file.

Instructions:
- **Attempt any five questions out of seven**
- **Draw neat sketches/diagrams wherever required**
- **Assume suitable data if necessary and state them clearly**
- **Figure on right indicate maximum marks for the given question, course outcomes attained and module no. of questions**

Q1	**Answer of following questions:**	**(20)**		
(a)	The levels of air pollutants as observed in Anand Vihar in Delhi (especially during winter months after Diwali) were as follows	**(10)**	CO1-4	M.1
	PM 10= 1084ppm			
	PM 2.5= 430 ppm			
	NO_2=111ppm			
	Ozone= 69ppm			
	SO_2=89ppm			
	Comment on the values. Explain with regards to ELR and DALR and various types of plumes observed during various times in a day. Give an account of two similar episodes which have occurred due to similar conditions in past.			
(b)	The Hydrocarbons in Jamnagar area of India were found to be 16000mg/kg of soil whereas there shouldn't be any present in natural soil or the levels should be less than 200 mg/kg. Explain any two techniques which can be adopted to remediate soil.	**(05)**	CO1, 3	M.2
(c)	Convert the following quantities	**(05)**	CO3, 4	M.1
	(i) 250 $\mu g/m^3$ of NO_2 to ppm at 1.5 atm and 25°C			
	(ii) 10% HC to $\mu g/m^3$ at 1 atm and 15°C			
Q2	**Answer of following questions:**	**(20)**		
(a)	Explain crown corrosion and self cleansing velocity for sewers? In Noida it was found that there is a 50 cm diameter sewer having an invert slope of 1 in 500 was flowing full, determine the velocity of flow and discharge? Is the velocity is self-cleansing? What will be the velocity and discharge when the sewer is flowing 0.35 and 0.8 times 'D'. **Consider d/D =0.35, v/V =0.852, q/Q = 0.327 and for d/D =0.8, v/V =1.14, q/Q = 0.988.**	**(10)**	CO3	M3
(b)	Explain with neat sketch any two (i) Lamp hole (ii)Water Test (iii)Drop Manhole	**(05)**	CO2, 3	M3

(c)	Enlist shapes of sewers. Explain differences of egg-shaped and circular sewers. Enlist the structural loads and stresses considered while doing structural design of sewer	(05)	CO2,3 M3

Q3	**Answer the following questions:**	**(20)**	
(a)	A river named Thames flows through England and tends to receive untreated sewage from the London. Explain the natural methods available for purification of the river along with the zones in river. Explain factors impacting purification.	(05)	CO2,3 M4
(b)	Derive an equation for 1st stage BOD curve. The dilution water (CONTROL) has initial DO of 8 mg/L and the diluted sample from has DO 8 mg/L. The dilution for BOD sample is 1%. After 5 days at 20°C DO in diluted sample falls to 3 mg/L and that of Control is 7.8 mg/L. Find BOD_5 of sample at 20°C. The K_{10} value is 0.1/days. Find the BOD of same sample at 40°C at the end of 2 days. $\Theta = 1.056$	(7.5)	CO2,3 M.4
(c)	Define relative stability, population equivalent, aerobic process, facultative process and anoxic processes	(7.5)	CO3 M4

Q4	**Answer any two of the following questions:**	**(20)**	
(a)	The Municipality of Rajkot needs to design a wastewater treatment plant for a sewage generating from population of 1,00,000. The domestic wastewater to be treated has initial BOD of 300 mg/L and S.S. concentration of 330 mg/L. Determine BOD load in kg/day and solids loading in kg/day. Illustrate the basic flowsheet of wastewater treatment plant that can be proposed with function of each unit and expected reduction in BOD. The effluent standards as per the Government requires 30 mg/L of BOD and 100 mg/L of SS. If the treated wastewater is to be reused for industrial cooling water, list the additional units required.	(10)	CO2-4 M.5
(b)	Explain with Short Notes (i) Pumping station (ii) Skimming Tanks (iii)Relative stability	(10)	CO2-4 M.5
(c)	Explain grit chamber. Design a grit chamber only to treat average flow of 30 MLD of sewage to remove particles of size of 0.2 mm and specific gravity of 2.65. (Take $v=1.141 \times 10^{-6} m^2/sec$, $K_c=3.5$)	(10)	

Q5	**Answer any two of the following questions:**		
(a)	Explain with short notes (1)Modification in activated sludge process (2) Rotating biological contactors (3) Stabilization Pond	(10)	CO1-2 M.5
(b)	Differentiate types of trickling filters with respect to design criteria. In a treatment plant in Rajkot high rate trickling filters are used as the secondary treatment. It is proposed to use two stage trickling filter plant for 5 MLD raw sewage with influent BOD as 300 mg/L. Organic loading that can be applied on first stage is 12000 kg of BOD/hectare.m/d. Find the outlet BOD after the treatment if recirculation ratio for both the stages is 1.25. Assume 25% reduction in PST.	(10)	CO3,4 M.5
(c)	In an alternative treatment plant in Rajkot activated sludge treatment is provided as biological treatment. Explain the activated sludge process to the engineers in the plant in written format with a sketch. Design a continuous flow completely mixed activated sludge process with following data. Sewage flow 5000 m^3/d; Influent BOD =300mg/L; Effluent BOD= 20 mg/L; MLVSS= 3000mg/L; MLVSS/MLSS=0.8; Return sludge concentration as SS= 15000mg/L; Y=0.7; $k_d=0.05d^{-1}$; $\Theta_c=10$days. Compute oxygen requirement also. Give all checks	(10)	CO3,4 M.5

Q6	**Answer the following questions:**	**(20)**	
(a)	Explain septic tank. A hostel in Mumbai and has population of 200 residential graduates. Design septic tank with water demand of 180 lpcd. What would be the size of soak pit if the percolating capacity of the filtering media is 900 L m^3 d^{-1}?	(10)	CO1-CO3 M.6

(b) Explain the process of anaerobic digestion.   (10)   CO1-   M.6
Determine sludge volume before and after digestion and percentage reduction of   CO4
750 kg (dry basis) of primary sludge with following characteristics. Assume 60%
of volatile solids are destroyed during digestion. (assume γ_w=1000kg/m3)

Characteristics	Primary	Digested
Solids	5%	10%
Volatile Solids (VS)	60%	60% destroyed in digester
Sp.gr. of Fixed Solids (FS)	2.5	2.5
Sp.gr. of Organic Solids (VS)	~1	~1

Q7   **Answer <u>any four</u> the following questions:**   (20)   CO3
(a)   Give salient features of Air Act, 1981   (05)   M.7
(b)   Explain auditing and types of audits   (05)   M.7
(c)   Rain water harvesting   (05)   M.3
(d)   Secondary sedimentation   (05)   M.6
(e)   Sludge foaming and sludge bulking   (05)   M.5

Formula Sheet :

$$V_S = \frac{p_w\, g\,(S_s-1)d^2}{18\mu}$$

Or $V_S = \frac{g\,(S_s-1)d^2}{18\upsilon}$

Or $V_S = 418(S_s-1)d^2\,(T+10)/60$

$V_c = 3$ To $4.5\ \sqrt{(g\ d\ (S_s-1))}$

$v_c = \sqrt{\frac{8\beta g(S_s-1)d}{f}}$ $E_2 = \dfrac{100}{1+\dfrac{0.4432}{1-E_t}\sqrt{\dfrac{w_2}{VF}}}$

$$\cos\frac{\theta}{2} = \left(1 - \frac{2d}{D}\right)$$

$I=a/t^n;$ $I=a/(t+b)$

$Y=0.5\sqrt{B}$

$R=A/P$

$Q=A.V$

$$\frac{W_s}{S_s} = \frac{W_f}{S_f} + \frac{W_w}{S_w}$$

$$\eta = 1-\left(1+\frac{n(v_s)}{Q/A}\right)^{-\frac{1}{n}} \qquad q = \frac{Q}{A}$$

BHP = (w.Q.H)/(75.η_p. η_m)

$$\frac{Qr}{Q} = \frac{x_t}{\left(\dfrac{10^6}{svi} - x_t\right)}$$

Conc (μg/m^3)=$\dfrac{ppm*MW*1000}{22.4}$

$$Q_{max} = \left(1+\frac{14}{4+P^{0.5}}\right)Q_{av} \qquad F = \frac{1+R}{(1+R/10)^2}$$

$$Q_W = \frac{VX}{\theta_c Xr}$$

$$\frac{1}{\theta_c} = \frac{Q}{V}\left(1+r-r\frac{Xr}{X}\right) \qquad U = \frac{Q*(So-S)}{V*X} \qquad T = \frac{La}{20}-1$$

$A=0.00622.q/V_r;$ $h_L=0.0729(V^2-v^2)$ $v=Q/W*d$ $\dfrac{W_s}{S_s} = \dfrac{W_f}{S_f} + \dfrac{W_w}{S_w}$

$Q = C.I.A / 360$

$I = 760 / (t+10)$ $V = \dfrac{1}{n}*R^{\frac{2}{3}}*S^{\frac{1}{2}}$

$I = 1\,020 / (t+10)$

$V = 0.849 C_H R^{0.63} S^{0.54}$ $\dfrac{F}{M} = \dfrac{S}{\theta*X}$ $S_R = 100(1 - 0.605\ ^t37)$

$$t_0 = \frac{d^2(0.011d + 0.785H)}{Q}$$

$$U = \left(\frac{F}{M}\right)*\left(\frac{E}{100}\right) \qquad PE = \frac{BOD\ load\ from\ industry\ \left[\frac{kg}{day}\right]}{0.054\ \left[\frac{kg}{inhab\cdot day}\right]}$$

$$E = \left(\frac{S_o-S}{S_o}\right)*100$$

$$E_1 = \frac{100}{1+0.4432\sqrt{\frac{w_1}{VF}}} \qquad Ns = \frac{3.65n\sqrt{Q}}{H^{0.75}}$$

$$L_t = L_o(10^{-Kt}) \qquad x=xa+xe+xi$$

$$BOD5 = (DO_{1s} - DO_{5s})*dilutionfactor - (DO_{1b} - DO_{5b})$$

$$\theta_c = \frac{V*x}{Q_w x_w + Q_e x_e} \qquad h_f=flv^2/(2gD) \qquad V_{sl} = \frac{W_s}{\gamma_w S_{sl} P_s}$$

$$U = \frac{Q*(So-S)}{V*X} \qquad O_2\ (g/d) = \frac{Q(S_o-S)}{f} - 1.42\,Q_w X_r$$

$$\theta_c = \frac{V \cdot x}{(Q + Q_r)x - Q_r x_r}$$

$$V = \frac{YQ(S_0 - S)\theta_c}{x(1 + k_d)\theta_c}$$

$$\theta_s = \frac{V_s}{Q}$$

$$\frac{f}{m} = \frac{So*Q}{V*X} = \frac{So}{\theta*X}$$

$$y_t = L_o(1 - 10^{-Kt})$$

Q= 130/√t (lpd/m²)

$$Volume = \left[Vf - \frac{2}{3}[V_f - V_a]\right]T_1 + V_d T_2$$

$$Volume = \frac{1}{2}[V_f + V_d]T_1 + V_d T_2$$

Parameters

4-8 hrs	n=0,1/8,1/4,1/2,1	1.8-3m; 1 to 4 m³/d/m²; 0.08-0.32kg/m³/d	
50 – 150 ml/gm	ML= 90 m	0.9-2.5m; 10-40m³/m²/d; 0.32-1 kg/m³/d	
	MW= 30 m	0.6-1.6kg/d/m² 6-35 m	
	L:W= 1.5:1 to 7.5:1	1.6-6.4 kg/d/m² 1 in 6 to 1 in 10	
	L:D= 5:1 to 25:1	10-20 days 1.2 to 2 m	
	D= 3 to 50 m	30- 40 days 4.5 to 6 m and maximum 9m	
	7.5-10%	0.9 m³	
	D= 2.5 or 3.5		
0.7-1.2 m/s	125m³/d/m	0.1 to 0.15per capita with dry solid loading of 80 to 120	
	185m³/d/m	kg/m²/year	
		0.2 0.175 -0.2 m²/c/yr area or 60-120 kg/m²/yr	
0.2-0.4/day	25-35 m³/m²/d; 50-60m³/m²/d	$Q \max = \frac{5Q_{av}}{P^{0.2}}$ $Q_{max} = \left(1 + \frac{14}{4 + P^{0.5}}\right)Q_{av}$	
5-15 days	15-35 m³/m²/d; 40-50m³/m²/d	$Q = 10^4 A * I * \frac{Ri}{1000*3600}$	
0.3-0.6kg/m³/d	25-50%	12 to 25 min/cm	

Final year B.Tech. Civil. Sem VII

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Munshi Nagar, Andheri (West), Mumbai – 400058.

END SEM

Max. Marks: 100
Duration: 3 hr
Class: Btech
Name of the course: Limit State Method for RC Structures

Q.P. Code: BTC 401
Course Code : BTC 401
Sem-VII
Program: Civil Engineering

Master file.

Instructions:
1) Question No. 1 is compulsory.
2) Attempt any four from the remaining questions.
3) Draw reinforcement details wherever necessary.
4) Use of IS 456:2000 is permitted.

Question No			Maximum Marks	Course Outcome Number	Module Number
1	a)	State and explain the assumptions made in LIMIT State of collapse(Flexure).Also draw stress and strain diagram across the section.	05	1	2
	b)	What do you mean by Limit State. Explain various limit states.	05	1	2
	c)	When it is required to design doubly reinforced beam section. Also draw various forms of shear reinforcement provided in beam.	05	1,2	3
	d)	Derive design stress block parameters for singly RC sections for LSM of design.	05	1,2	2
2	a)	RC section 230mmx550mm depth overall and reinforced with 4-20mm dia is used as simply supported beam over an effective span of 6m. Determine the maximum udl beam can carry safely.Use M 25 and Fe-500	10	1,2	3
	b)	A rectangular beam 400mm x700mm effective depth is reinforced with 6 bars of 20mm dia in tension zone .The beam is subjected to udl of 50kN/m over span of 8m.Design shear reinforcement if two bars are bent up at 45° near end of each support.Use M30 and Fe 500	10	1,2	3
3)	a)	A RCC beam reinforced on tension side is 230mm wide with an effective depth of 500mm.It is reinforced with 4 bars of 20mm diameter .Calculate the ultimate moment of resistance using Ultimate Load Method.Take $\sigma_{cu}=20N/mm^2$ and	08	1	1

		$\sigma_{sy}=425N/mm^2$.			
	b)	An isolated TEE beam section having an effective depth of 580mm ,flange width of 12400mm ,rib width of 300mm ,slab depth of 120mm comprises of 8 bars of 20mm diameter. Calculate moment of resistance of beam. Use M-20and Fe-415.	12	1,2	4
4)	a)	Draw Pu-Mu curve for column of given proportions. Explain Region II and III of the curve in detail.	10	1,2	6
	b)	Design short helically reinforced column to resist service load of 1400kN.Use M30 and Fe 415.Draw reinforcement details.	10	1,2	6
5)	a)	Design a RC slab for an interior panel of a **passage** of a residential building. The size of panel is 4mx 4m.Using appropriate loading , design the slab panel. Give appropriate checks. Use M35 and Fe 415.	16	1,2	5
	b)	Explain in brief Whitney's theory.	04	1,2	1
6)	a)	A rectangular column of dimension 300mmx450mm is subjected to an ultimate axial load of 1000kN.Design isolated footing for column assuming SBC as 250kN/m^2.Use M30 and Fe 415.	15	1,2	7
	b)	Write a short note on various types of footing under various conditions showing sketches.	05	1,2	7
7)	a)	A RCC beam 3000mm x450mm effective is subjected to an axial moment of resistance of 224kN-m.Find out the steel required using Ultimate Load Method. Take $\sigma_{cu}=20N/mm^2$ and $\sigma_{sy}=425N/mm^2$.	10	1	1
	b)	Design one way slab panel of RCC residential building having dimensions 3mx6.5m. Using LL=2kN/m2 and F.F=1.5kN/m2 , design the slab panel. Give appropriate checks. Use M30 and Fe 415.	10	1,2	5