SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

2016/24

End Semester - June 2024 Examinations

Program: F.Y.M.Tech (Structural Engineering) **Duration: 3 Hours**

Course Code:PE-MTSE211 **Maximum Points: 100**

Course Name: Bridge Engineering **Semester: II**

Notes:
1) Attempt any 5 questions out of 7
2) Assume suitable data if missing and mention the same
3) Answers to all sub-questions shall be grouped together
4) Use of IRC 6, IRC 112, IS 800 and steel tables is allowed

Q.No.	Questions	Points	CO	BL	Modı
1)	a) Explain in detail – Bearing articulation for straight and curved bridges	10	1	2	5
	b) Explain the various loads and load combinations to be considered as per IRC 6 on a highway bridge having 3 lanes.	10	1,5	2	2
2)	a) Design an RCC slab of a solid slab bridge with following details Effective span = 6m Carriageway width = 8.5m SIDL = 10 kN/m Wearing course = 65mm thick The bridge is subjected to 1 lane of IRC Class 70R tracked vehicle. Use M30 and Fe500	20	3,5	4	3
3)	a) Obtain the maximum bending moment at centre and absolute maximum shear force for a girder of span 20m subjected to a single class 70R wheeled vehicle and having a courbon factor of 0.55	7	1,5	4	2,3
	b) Design T-beam girder of span 20m as per IRC 112 with following specifications: UDL on girder due to SIDL = 12kN/m UDL on girder due to wearing course = 2.35kN/m UDL due to slab = 20kN/m Live load as per Q.3(a) Effective slab width as beam flange = 2.5m Depth of slab = 0.25m Use M35 and Fe500	13	3	4	3

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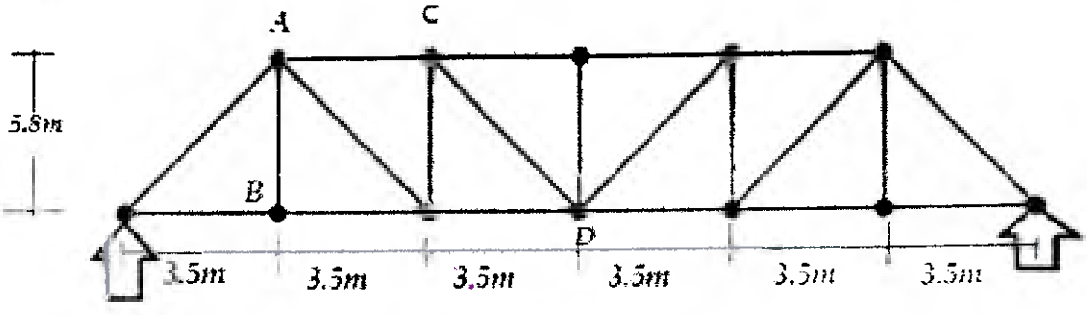
4)	For the steel truss bridge shown below: Equivalent UDL due to live loads = 60kN/m SIDL = 15kN/m Self weight per node = 100kN Use E250grade steel. Design members AC and AB. Also design the connection at A for these members.	20	3	4	4



5)	a) For bridge pier having seismic mass at top as 4000kN, the height of pier is 8m and the cross section is 1.5m diameter made of M40 concrete. Assume the base to be fixed and obtain : i) Time period as per IRC ii) Base shear acting on the pier	10	5	2	7
	b) Calculate the axial load and uniaxial moment carrying capacity of an RCC pier of size 1500 x 1500 mm. The pier has 7 bars of 25mm diameter along each face. Concrete grade is M40 and steel grade is Fe500. ***Assume:*** Neutral axis at 550mm from extreme compression fibre. Use rectangular parabolic stress block as per IRC 112	10	3	4	5
6)	Design a shallow foundation as per IRC 112 for a pier of size 1.5m x 1.5m. The design axial load = 2800kN and design moment along transverse axis = 800kNm. SBC of soil = 175kN/m^2. Use M40 and Fe500. Provide checks for : a) Flexure b) One way shear c) Punching shear at distance 2 x depth of footing from face of pier and at face of pier	20	3,5	4	5
7)	a) Explain the balanced cantilever method of construction for bridges with neat sketches. Explain the suitability of this method for constructing bridges.	10	2,4	2	6
	b) Write a note on bridge aesthetics	10	1	2	1

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End Semester Examinations June 2024

English for research paper writing

Program: **M.Tech CME**
Course Code: **AE-MTSE 201-202**
Course Name: **English for Research paper writing**

Duration: **03 hours**
Maximum Points: **100**
Semester: **II**

- **Note:**
- Total seven questions are given
- Attempt any **five** questions
- Question 01 is compulsory
- Out of remaining questions attempt any 04
- Subsections of questions are to be attempted together.

Q.No.	Questions	Points	CO	BL
1.A.	Explain in detail why proficiency in English language is mandatory for researchers. How good English language does help in writing effective research thesis?	10	01	03
1.B.	A student complained that she was having trouble with the following foreword, that it was more like an introduction than a foreword (and she was right). Turn it into a foreword by eliminating details unnecessary for a managerial reader. Feel free to write the sentences and move information around. ***Foreword:*** Flutter is a phenomenon in which structural instabilities are often characterized by divergent oscillations of the wings, resulting in structural failure and possible loss of the aircraft. Flight flutter testing involves the tracking of damping estimates of the excited vibration modes at different flight conditions. The violent nature of flutter makes safety an important concern during flight flutter testing. As with any flight test program, cost is also a major concern. Our objective at Smith is to provide safe testing at the lowest cost. Costs can be lowered by decreasing flight time. This requires utilizing the fastest analysis techniques that will meet the accuracy requirements that safety demands. Presently we have two software packages available for data analysis	10	01	01

	during flutter testing. They Are: 1. The Power Spectral Density Package (PSD) 2. The random Decrement (Randomdec) Package. The main objective of each package is to determine damping estimates of the structural modes. I was assigned to do a comparison study of two packages looking at two questions 1. How accurate are the dumping estimates? 2. How much time is required for analysis? These questions are concerned with safety and cost respectively. The purpose of this report is to present the findings of my study and to make some recommendations concerning future testing.			
2. A.	"Barriers lead to miscommunication or misinterpretation of information or ideas". Explain in detail the barriers faced by researchers while reading technical papers. Describe the four levels of reading.	10	02	02
2.B.	Explain the Strategies for effective reading techniques for journal papers. Draw a systematic diagram to reading technical papers.	10	02	05
3.A.	Answer any 2 questions from the following (100 Words Each) 1. Discuss Email as a channel of communication 2. Explain the basic characteristics of a good report. 3. Explain the SQ3R technique to improve research paper reading 4. What are the two types of application letter?	10	04	02
3. B.	Write a mail to Head of your department seeking permission to conduct a one week short term training program through the placement cell. Invent necessary details with schedule and details of speakers.	10	03	04
4. A.	Here is a first- hand account of a very good public speaker who trains professionals in public speaking. I train business professionals in public speaking and also in preparing their project proposals and presentations. One day, my friend Mohan called and asked if I could help his boss, Mr. Andrew's who had to speak at the convocation ceremony of an engineering institute in Mumbai. I asked if his boss knew what he wanted to say, and Mohan said yes, but the talk was not developed yet and his boss wouldn't have time to devote to it until the weekend. I learnt from Mohan that Mr. Andrews was really smart but not experienced in speaking to large groups. We set up two meetings with Mr. Andrews- the first to discuss what the message would be; the second to practice it. I asked for a general	15	04	03

summary of what would be said. Mohan replied, 'He is going to say something about today's job market for Engineering graduates due to the impact of pandemic and about its future as well. I was expecting to be briefed by Mohan on the content of his talk.

When I walked for the meeting, the receptionist escorted me into a meeting room off the lobby. Mohan too arrived, handed me his business card, and briefed me on the status of the scripts and slides (a work in progress). Shortly, Mr. Andrews arrived with a handful of wrinkled papers in his hand. They were his notes. He did not know how to connect his computer to the projector, or how to use power point well enough to re-sequencing the slides and add appropriate designs, insert tables and animate the slides where needed. However, his knowledge of contemporary job market was encyclopedic and the rate at which he spoke was supersonic. When I asked questions about his topic so that he could clarify what he wanted to say, and in what order, he was wonderfully patient with my modest understanding of his discipline, and used analogies and metaphors to explain his point-a sign, I think, of a good communicator.

In addition to speaking very fast he did not look me in the eye, and also did not relate what he said to the bar charts on the screen. But he spoke with visceral passion and emphatic verve about the way multinational companies are working these days – and that made up for his other flaws as a speaker. He could lift up his whole body and jump into a keyword with both feet-giving it real meaning and significance.

The challenge, however, was to develop his topic so that the audience would think they were hearing a standard talk about globalization and job markets for fresher's in particular and further developing to talk to strategies to get placed in good companies.

After two meetings, we cut the slides down to 40 and the timing down to One hour. He had no time to rehearse. He promised he would work on it in his hotel room when he arrived in Mumbai. I continued to email him suggestions over the weekend.

I learned from Andrews that he did not rehearse until he was on the plane, and then he stayed up most of the night in a panic working on it. Two days after the event, he called to say it went well, and that me emails helped. I called Mohan to get his assessment, who said it was a little short- much shorter than the presentations made by other speakers.

	I pointed out that short presentations are not a bad thing-'For a speech to be immortal, it not be interminable'. The points Andrews needed to remember were as follows: 1. Get attention of his audience 2. Sustain the attention 3. Make a clear point in a memorable way 4. Be unique in his own way 5. Persuade people to come to talk to him His job was to generate trust and curiosity among his audience and sustain their interest in his convocation address. **Questions:** 1. 'Mr. Andrews had not adequately planned and prepared his presentation'. Do you agree or disagree with this statement? Explain in detail the steps that Mr. Andrews needs to work on for planning the presentation. 2. What are the factors that Mr. Andrews need to keep in mind regarding the designing of his power point slides his body language, time and word budgeting during presentation.			
4.B.	Prepare an Introduction to Mr. Andrews's presentation keeping the Delivering effective presentations syllabus topic in mind.	05	04	03
5.A.	Apply for the position offered by "Shine International groups' ltd' Write a cover letter and detailed **Curriculum Vitae** for the job position given below. **(Invent necessary details)** Selected Engineer's Day-to-day Responsibilities Include • Execution Planning of all the site civil related works - Earthwork / Civil work/ Footing Foundations, /JCB/ Dozers, etc., • Ensuring the quality of construction Materials • Project work scheduling and maintaining the project Deadlines • Project execution co-ordination with Consultants, Surveyors, Vendors, Management, etc., • Responsible for inventory storage of materials on the site.	20	04	06

	• Preparing daily reports on closing stocks, labor attendance tasks done, etc. • Administrative area: Budgets / indents / review, etc. • Weekly submission of bill book, petty cash accounts with respect to the site works. • To receive materials submit necessary documents for the same. • Fix Agenda for review meetings, etc. Desired Candidate Profile • M.Tech in Civil/ Electrical engineering • 0- 2 years of Experience as a Civil/Site Engineer • Intermediate knowledge required on AutoCAD, GIS and MS office Role Structural/ Construction Management Industry Type Engineering Construction Functional Area Site Engineering, Project Management Employment Type Full Time, Permanent Role Category Site Engineering Education PG : M.Tech /B.Tech. in Civil **For Electrical Students:** We seek a passionate, dynamic, and creative Electronics Engineer to join our team. Responsibilities • Full product design • PCB design and layout • Electrical design including component selection, thermal system design, and interconnection hardware selection/design. • Create assist with the documentation and implementation of Engineering Changes to the product design • Work fluidly in a high cross-functional environment involving manufacturing, product development, as well as supply chain specialists, product design engineers, and logistics personnel. Behavioral Traits • Self-managed and willing to work in a fast-paced and time-variant environment • Ambitious, self-starting and motivated attitude; willingness to learn Requirements • **Bachelor/ Masters of Engineering/Technology in Electrical/Electronics/Mechatronics • Diploma in Engineering in Electrical/Electronics/Mechatronics** • Previous internship project experience is a plus. (Self-projects most			

	appreciated) • Experience with software and hardware used in electronics product testing • Highly proficient in hands-on skills, especially soldering and component-level assembly, and troubleshooting equipment • Fundamental knowledge of circuit design, battery-powered systems, refrigeration and air conditioning, electrical engineering materials, computer-aided electrical drawing, and manufacturing process • Computer Basis (MS Office, Online Collaboration Tools) careers@seebecutilities.com			
6.A	The Government of India is concerned about the steady increase in the outbreak of diseases among working class especially youth. In order to work on the possible solutions, the Health Minister has asked you as the Chief Medical Officer of IMSI Delhi to find out the possible causes of these diseases, the problems faced and other related factors. On the basis of the data provided draft a **letter report** as Chief Medical Officer Delhi and submit your report with recommendations to the Health Minister of India. 1. Table showing diseases and the percentage of people suffering from it.	20	02	04

Sr.No	Name of Diseases	Percentage of people suffering from it.
1.	Diabetes	25%
2.	Blood Pressure	20%
3.	Stress	25%
4.	Asthma	10%
5.	Heart attacks	10%
6.	Slip Disc	10%

Please provide at least five recommendations to improve the situation

7. A.	Read the given report carefully. The report given here is not written in proper format and language. **Rewrite the complete report in (Memo Format) with complete details. Invent necessary details.** (Make changes in style, sentence-construction, and sequencing and make it objective and remove vagueness wherever necessary). Topic: The personnel officer of a factory reports on apprentice unrest. Date: 13th June, 2024 To: The General Manager From: the Personnel Officer Subject: Apprentice unrest at K K Engineering Pvt. Ltd.	20	03	04

Terms of Reference: According to the instructions given by you, a report has been compiled on apprentice unrest and recommendations made.

Procedure

1. Interviewed twenty apprentices on the shop floor at random
2. Interviewed all supervisors and foremen concerned with apprentices.
3. Checked the data and records

Facts Findings:

1. Extent of Unrest: The results of the interviews with the supervisors and foremen were real eye–openers to say the least. I was shocked to hear that there is widespread resentment among the apprentices. They hinted that although everything seems calm on the surface, there is seething discontent and the situation may deteriorate unless we sit up and take note.

2. Cause of Unrest: The apprentices are disgruntled because of the following matters:

2.1. Training: They complained to me that:

2.1.1. Supervisors are never there when they are needed

2.1.2. We are used only on production lines

2.1.3. We are never given a chance to learn something new.

2.2. Conditions: They cribbed about the fact that:

2.2.1. Working conditions in the factory are not conducive

2.2.2. The supervisors ignored the safety precautions.

3. Results of data and records

3.1. salary unpaid

3.2. Promotions and perks not given

Conclusion:

You must take immediate action to prevent disturbance and resolve grievances immediately. The records of all complaints were checked and found that there was no action on the complaints.

Recommendations:

1. Complaints regarding training should be resolved.
2. Working conditions should be improved
3. Rates of pay should be revised.

13th June, 2024

XYZ Personnel Office

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24/6/24

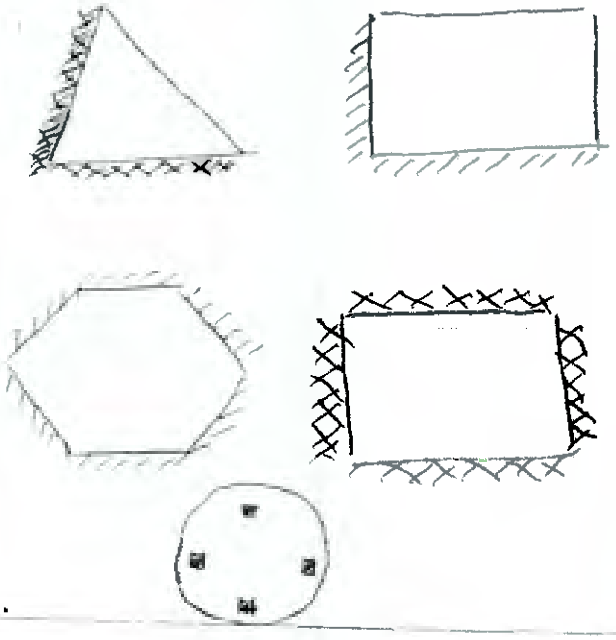
END SEMESTER EXAMINATION JUNE 2024

Program: M. Tech (Structural Engineering) **Duration: 3 Hr.**

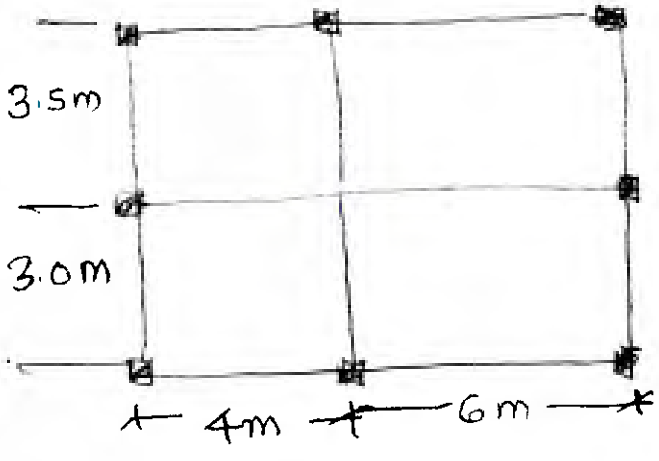
Course Code: EC MST214 **Maximum Points: 100**

Course Name: Advanced design of concrete structures **Semester: II**

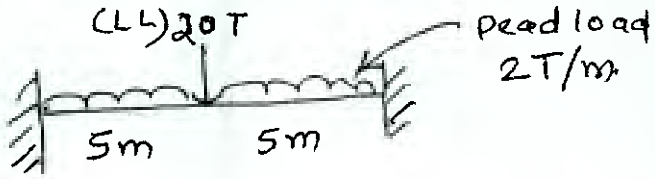
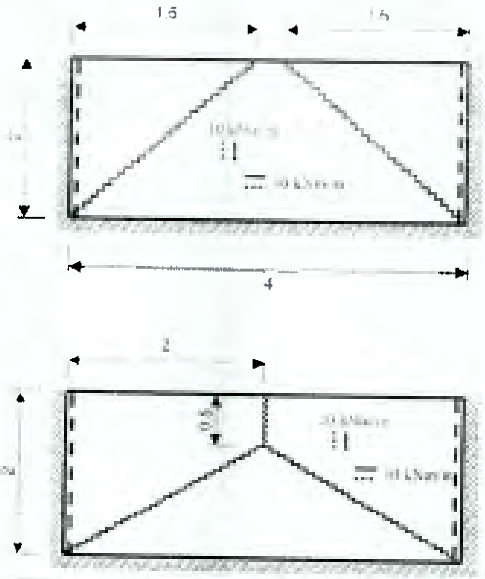
Notes: Q.1 is compulsory, solve any 4 question out of remaining questions

Q.No.	Questions	Points	CO	BL	PI
1(a)	Draw the yield line pattern for the following slabs 	10	1	3	
1(b)	Explain tension hinge and compression hinge used in Baker's method of analysis.	10	1	2	
2(a)	Design a reinforced concrete beam of overall size 25 cm x 60 cm for ultimate moment of 45,00,000 kg cm. Assume σsy= 2800 kg/cm2, σcu= 250 kg/cm2 . **Use Ultimate Load method**	5	1	4	

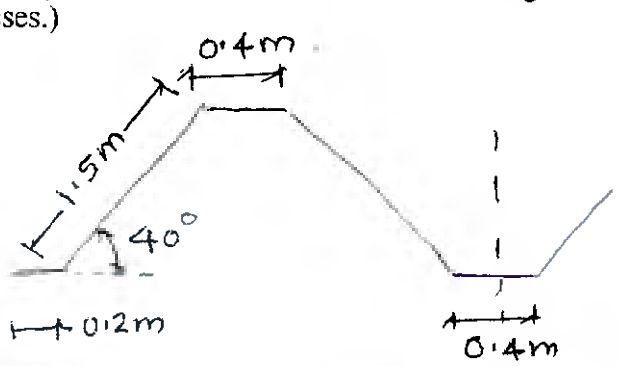
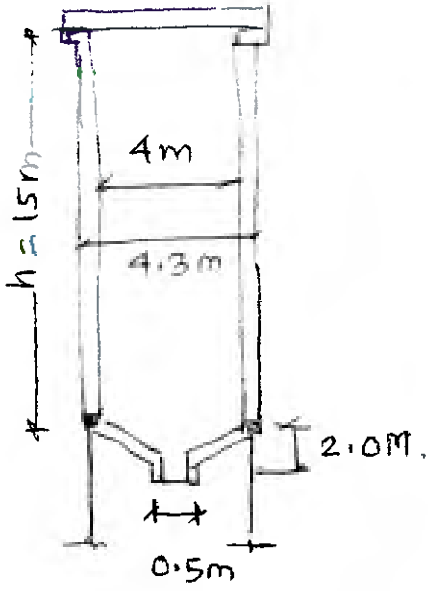
END SEMESTER EXAMINATION JUNE 2024

2(b)	For a 3 span continuous beam subjected to udl of 2.5 T/m including self weight. Length of span 5.0 met Assume following data: B = 30 cm d=50 cm σcu= 250 kg/cm2 σsy = 2350 kg/cm2 εsy =0.0012 mild steel Tensile steel 3 no 20 mm dia bars. **Use Baker's method** Evaluate A) EI B) Plastic moment C) Influence coefficients D) Relative rotation	15	1	5	
3(a)	For the slab beam arrangement shown **calculate design bending moments** for slab after redistribution of moments. The slabs are subjected to live load of 3.0 Kn/m2 in addition to floor load 1 Kn/m2 and self-weight. Use M 20 grade of concrete and Fe 415 steel.. **Use Limit State Method.** 	08	1	5	

END SEMESTER EXAMINATION JUNE 2024

3(b)	For the beam shown design size of beam considering b= 0.5d. Calculate area of steel required if yield strength of steel is 2800 kg/cm2and concrete is with 28 day cube strength of 200 kg/cm2.Give rotation checks and Serviceability check. **Use Cambridge method.**  Load factor – L L = 2.0 D.L = 1.5	12	1	4	
4	For interior panel of flat slab 6.0 M x 5.0 M subjected to Live load of 4.0 Kn/m^2 and floor finish load of 1.0 Kn/m^2 Design a slab without drop or column head **Calculate bending moment and reinforcement** **Draw a plan and section showing reinforcement** Use M 20 concrete and Fe 415 steel. **Use Limit State Method.**	20	1	6	
5	For the slab fixed on short edges and simply supported on one long edge and free on long edge as shown is with yield lines shown. Determine which is critical failure mode for a load w = 12 Kn/m^2 and capacities as shown 	20	1	4	

END SEMESTER EXAMINATION JUNE 2024

6	The trough type folded plate with cross section as shown is 20 m long. Thickness of plate is 110 mm throughout. Width of plate 1.5 m .The total load (DL+LL) on plate area is 350 kg/m2 Perform preliminary analysis neglecting joint displacement up to calculation of stresses. (No need for calculation of stress distribution and balancing the stresses.) 	20	2	6	
7	Design silo for storing Rice with over all dimension as shown. **Use Jansen's method**. Unit weight of Rice 8830 N./m 3 , Angle of repose 30 ^{0} Grade of concrete M 20 use mild steel. Design wall section and conical hopper bottom. $P_h = \frac{w\gamma}{\mu_f'}\left[1 - e^{-\left(\frac{\mu_f' K_f h}{r}\right)}\right]$  $P_v = \frac{P_h}{K_f}$	20	2	6	

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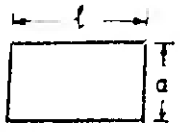
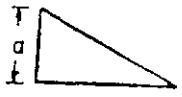
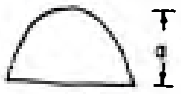
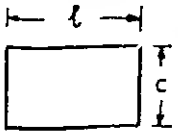
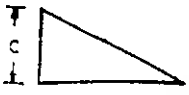
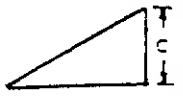
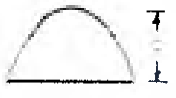
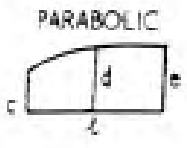
END SEMESTER EXAMINATION JUNE 2024

(*Clauses* D-1.1 *and* 24.4.1)

Case No.	Type of Panel and Moments Considered	Short Span Coefficients α_s (Values of l_y/l_x)								Long Span Coefficients α_l for All Values of
		1.0	1.1	1.2	1.3	1.4	1.5	1.75	2.0	l_y/l_x
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	*Interior Panels:*									
	Negative moment at continuous edge	0.032	0.037	0.043	0.047	0.051	0.053	0.060	0.065	0.032
	Positive moment at mid-span	0.024	0.028	0.032	0.036	0.039	0.041	0.045	0.049	0.024
2	*One Short Edge Continuous:*									
	Negative moment at continuous edge	0.037	0.043	0.048	0.051	0.055	0.057	0.064	0.068	0.037
	Positive moment at mid-span	0.028	0.032	0.036	0.039	0.041	0.044	0.048	0.052	0.028
3	*One Long Edge Discontinuous:*									
	Negative moment at continuous edge	0.037	0.044	0.052	0.057	0.063	0.067	0.077	0.085	0.037
	Positive moment at mid-span	0.028	0.033	0.039	0.044	0.047	0.051	0.059	0.065	0.028
4	*Two Adjacent Edges Discontinuous:*									
	Negative moment at continuous edge	0.047	0.053	0.060	0.065	0.071	0.075	0.084	0.091	0.047
	Positive moment at mid-span	0.035	0.040	0.045	0.049	0.053	0.056	0.063	0.069	0.035

TABLE 8.1 PRODUCT INTEGRALS—

M_k \ M_l				PARABOLIC 
	lac	$\frac{1}{2}\,lac$	$\frac{1}{3}\,lac$	$\frac{2}{3}\,lac$
	$\frac{1}{2}\,lac$	$\frac{1}{3}\,lac$	$\frac{1}{8}\,lac$	$\frac{1}{3}\,lac$
	$\frac{1}{2}\,lac$	$\frac{1}{8}\,lac$	$\frac{1}{3}\,lac$	$\frac{1}{3}\,lac$
PARABOLIC 	$\frac{2}{3}\,lac$	$\frac{1}{3}\,lac$	$\frac{1}{4}\,lac$	$\frac{8}{15}\,lac$
	$\frac{1}{2}\,lac$	$\frac{1}{4}\,lac$	$\frac{1}{4}\,lac$	$\frac{5}{12}\,lac$
	$\frac{1}{2}\,la\,(c+d)$	$\frac{1}{6}\,la\,(2c+d)$	$\frac{1}{6}\,la\,(c+2d)$	$\frac{1}{3}\,la(c+d)$
PARABOLIC 	$\frac{1}{6}\,la\,(c+4d+e)$ d = central ordinate	$\frac{1}{6}\,la\,(c+2d)$	$\frac{1}{6}\,la\,(2d+e)$	$\frac{la}{15}(e+c+8d)$
	$\frac{1}{2}\,lac$	$\frac{1}{6}\,lac\,(2-\alpha)$	$\frac{1}{6}\,lac\,(1+\alpha)$	$\frac{1}{3}\,lac(1+\alpha-\alpha^2)$

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End Semester Exam- June 2024

Program: M.Tech Civil Engg | **Duration:3hr**

Course Code: OE-MTSE202/OE-MTCM202 | **Maximum Points:100**

Course Name: Legal aspects in construction | **Semester:II**

Q.No.	Questions	Points	CO	BL	Module No.
1	Q.1) Write Short Notes (Any Four) a) Principles of Natural Justice b) Privity of Contract c) Accord & Satisfaction d) Advantages of collective bargaining e) Settlement agreement f) Lay-off,Lock-out & Strike	20	1,3,4	02	1,3,4
2	Define Voidable Contract.When Court declares the contract voidable? Discuss with Case Laws.	20	2	02	2
3	Unfair Labour Practices as per MRTU & PULP Act,1971.Discuss with Case Laws.	20	4	03	3
4	State the grounds for setting aside an Arbitral Award.Discuss with Case Laws.	20	3	02	4
5	Discuss with Case Laws the powers,duties & obligations of the Arbitral Tribunal.	20	3	03	4
6	What is breach of contract? Discuss the principles under the Indian Contract Act,1872 in which Court award damages with Case Law.	20	2	03	7
7	Explain in details • Salient features of Arbitration & Conciliation Act,1996 • Welfare measures for workmen under Building & Other Construction Act,1996	20	2	03	5,6

18/6/24

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

End Semester Re-Examination

M.Tech Civil Dyn. & Earthq. Engg. Sem II

June – 2024

Max. Marks: 100 Duration: 3 Hours

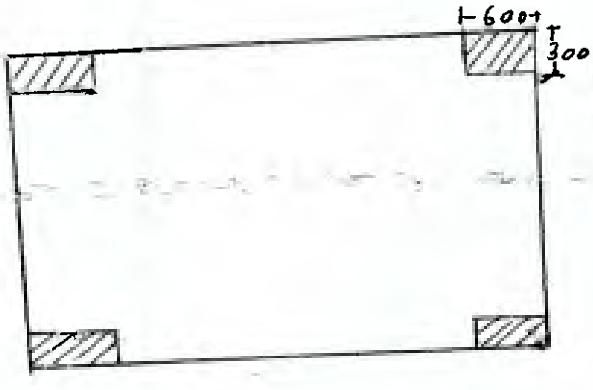
Class: M.Tech. Semester: II Program: Civil Engineering

Name of the Course: Earthquake Engineering Course Code : PC-MTE202

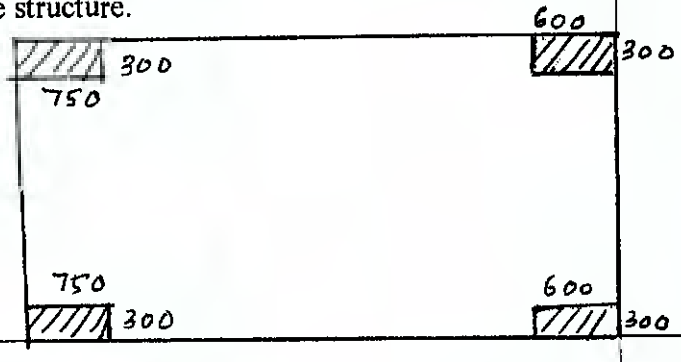
Instructions:

- 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

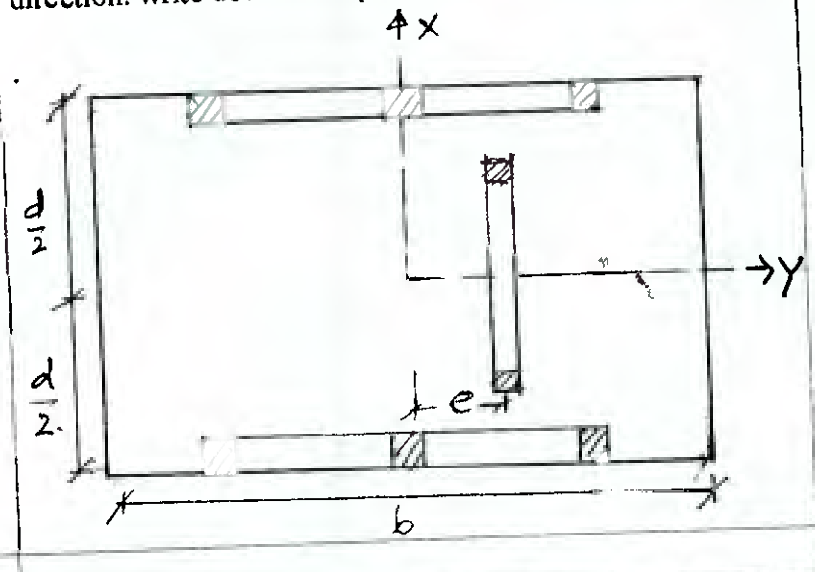
Question No		Max. Marks	Course outcome	Module No.
Q1 (a)	Answer the followings: (ii) Explain briefly the Magnitude and intensity of an earthquake	3	1	2
	(iii) Briefly explain the Plate Tectonic Theory of an earthquake	4	1 1	2 2
	(iii) Explain briefly the structure of earth.	3		
Q1 (b)	**(i)** A single-story structure with a rigid slab is supported on four corner columns as shown in the figure. The height of the structure is 6.0 m. In general, what will be the degrees of freedom for this structure? And specify these DoF. Calculate the structure's natural frequency for excitation in X and Y directions separately.	5	2	1
	(ii) If the system is subjected to harmonic ground acceleration with amplitude of 0.3g and excitation frequency of 25 rad/sec in X direction, evaluate the maximum lateral displacement of the slab. The weight on the slab is 150 kg/m^2, uniformly distributed. Assume ξ = 5% and E= 2x10^4 N/mm^2.	5	2	1,4



All col. same size

Q2 (a)	A rigid slab is supported on the four corner columns as shown in figure. Calculate the natural frequency and mode shapes for the structure.  	**12**	**2**	**1**
Q2(b)	If all the column sizes are same, calculate all the three natural frequencies (600 mm × 300)	**4**	**2**	**1**
Q2(c)	If this structure is subjected to an El Centro earthquake ground motion ground motion whose response spectra is shown in Figure 1 (i) only in X direction Only in Y direction separately. Calculate the maximum displacements of slab for both cases. Assume damping ratio $\xi = 5\%$.	**4**	**3**	**4**
Q3 (a)	A two-story frame with free vibration characteristics as given below is subjected to a ground motion whose response spectrum is shown in Figure 1. Calculate the maximum displacements of each story. Assume damping ratio ξ = 5%.	**8**	**3**	**4**
Q3 (b)	The plan of one story building is as shown in figure. The structure consists of a roof idealized as a rigid diaphragm, supported on three frames A, B, and C as shown. The roof weight is uniformly distributed and has magnitude 200 Kg/m2. The lateral stiffness are Ky = 30000 KN/m for frame A and Kx =25000 KN/m for frame B and frame C Kx=30,000KN/m. The plan dimensions are b= 30 m d=20m. The height of building is 10m.			

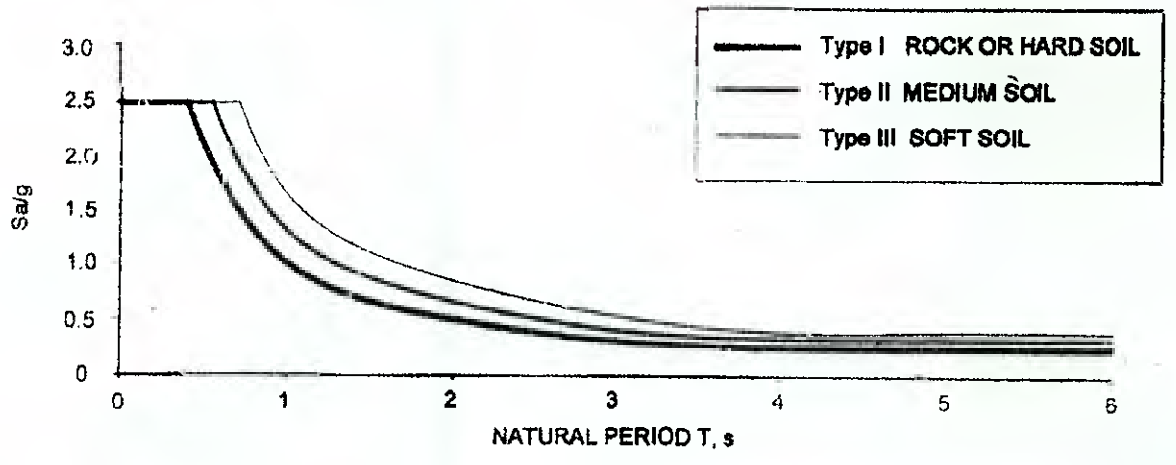
Floor No.	Mass (t)	Mode No.	ω, rad/sec	Mode shapes	
				Φ_{i1}	Φ_{i2}
1	85	1	9.714	1.0	1.235
2	60	2	30.58	1.0	-1.149

	(i) Derive the stiffness matrix (ii) If the structure is subjected to ground motion only in Y direction. write down the equations of motion for the system  	6 2	2 1	1 1
Q3(c)	As a special case, if Kx = 30,000 KN/m for both the frames B & C, and if the system is subjected to the ground motion only in X direction, the response spectrum of which is shown in figure1. Determine the design value of lateral deformation, base shear and bending moment for the system	4	3	4
Q4(a)	What is the response spectrum? Explain the procedure to construct an elastic response spectrum for a single recorded ground motion.	3	3	3
Q4(b)	Explain the characteristics of ground motions	3	3	3
Q4 (c)	A four-story school building special moment resisting frame has a story height of 4 m for the ground story and 3 m for the 2nd to 4th story. The building is located in Mumbai. The weight on the 1st to 3rd floor is 400 KN and on the 4th floor, it is 300KN. Using the equivalent static method, calculate the distribution of lateral loads and story shear. Assume soil strata as a medium. Use the response spectra given in Figure 2.	14	4	5
Q5 (a)	Explain the three requirements of displacement design of structure for earthquake load as per IS 1893-2016.	4	4	5
Q5 (b)	As per IS 1893-2016, how many mode need to be considered in the earthquake force calculation by Response Spectrum Method	2	4	5
Q5 (c)	State the limitation of Equivalent static Method. As per IS	2	4	5

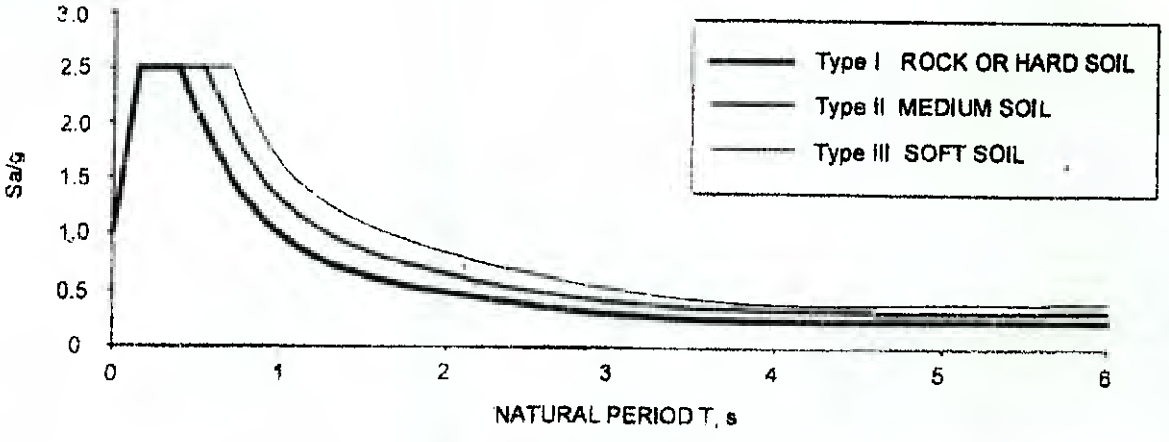
	1893-2016, under what conditions the Equivalent static Method is permitted to use to calculate the earthquake forces.			
Q5 (d)	Using response spectrum method, calculate the seismic force on each floor of the frame whose pre vibration properties are given below. Use the following additional data: Z=0.36, I =1.0, R=5.0 and ξ = 5%. Assume foundation strata as soft soil and use response spectrum given in figure 3. Assume the story height as 4m for all story.	**12**	**4**	**5**
Q 6(a)	What is response spectrum? Briefly explain the Response Spectrum characteristics	**4**	**3**	**3**
Q 6(b)	Briefly explain the following: (i) When the structure is subjected to torsion ? Briefly explain the IS 1893-2016 provisions for design for torsion. (ii) Explain the three requirements of displacement design of structure for earthquake load as per IS 1893-2016.	**6**	**4**	**5**
Q 6(c)	(i) A building having a non-uniform distribution of mass is shown in figure. Locate its center of mass Fig. 4 (ii) The plan of a simple one-storied building shown in figure. All columns have the same dimensions. Obtain the center of stiffness. (Centre of Rigidity). Fig. 5	**4**	**4**	**5**
Q 6(d)	The first floor plan of a building with shear walls is as shown in figure. The plinth level plan is also same. Calculate the fundamental period of the building as per the provision of 7.6.2, of IS 1893-2016 both in X and Y direction. The total height of building is 24 m. Fig. 6	**4**	**4**	**5**
Q 6(e)	For the SMRFs idealized as shear building with rigid girders, investigate whether the building structure has soft story. The height of first story is 4.5 m and that of remaining is 3.0 m. Fig. 7.	**2**	**4**	**5**

Story No.	Mass No.	Mass (t)	ω rad/sec	Mode shapes		
				Φ_{i1}	Φ_{i2}	Φ_{i3}
1	1	50	14.52	1.00	2.160	3.313
2	2	50	31.05	1.00	0.893	-1.473
3	3	40	46.10	1.00	-1.042	0.410

Q 7(a)	What is ductility of a structure? Explain the importance of ductility in seismic resistant structures.	3	4	7
Q 7(b)	What is shear Wall? Explain the advantages of shear walls for earthquake resistant structure.	3	4	6
Q 7(c)	Explain the provisions of IS 13920 for (i)Beams: General provisions, longitudinal reinforcement and web reinforcement. (ii)Shear wall: General requirements, and Provisions related to shear design	12	4	5,6
Q 7(d)	Briefly explain the different types of structural systems used in a building structure to resist lateral loads due earthquake	2	4	6



2A SPECTRA FOR EQUIVALENT STATIC METHOD



2B SPECTRA FOR RESPONSE SPECTRUM METHOD

FIG. 2 DESIGN ACCELERATION COEFFICIENT (S_a/g) (CORRESPONDING TO 5 PERCENT DAMPING)

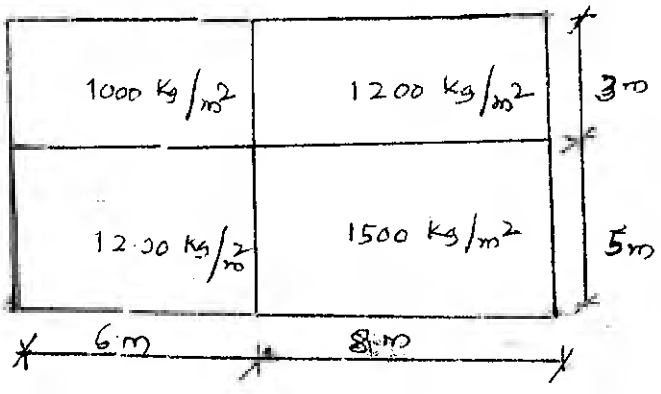


Fig. 4

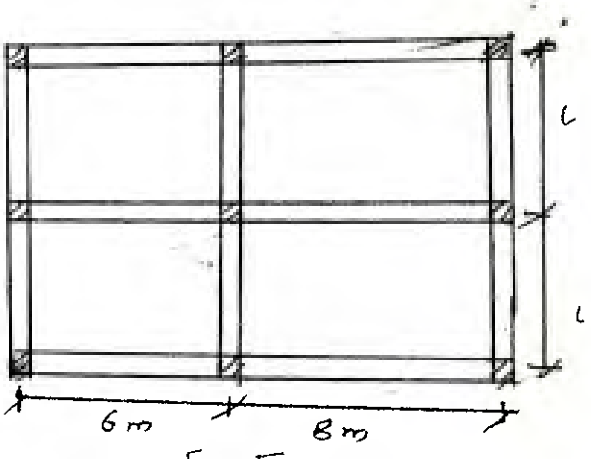


Fig 5

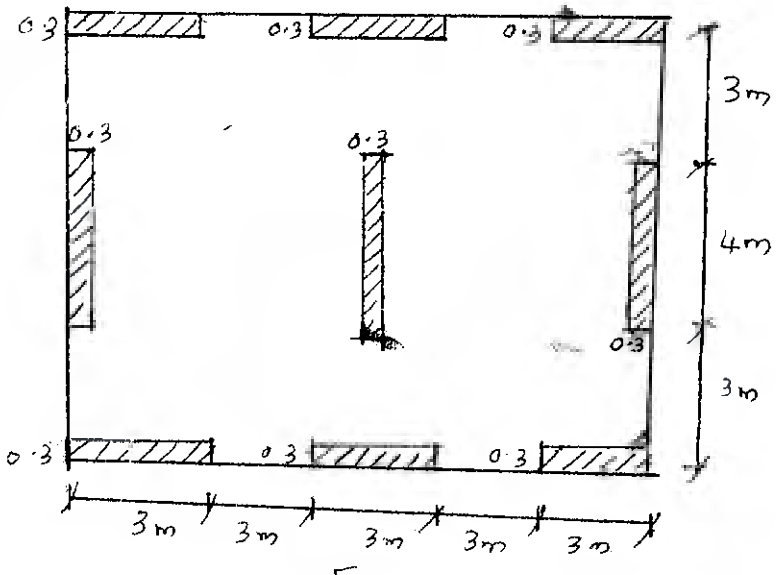


Fig. 6

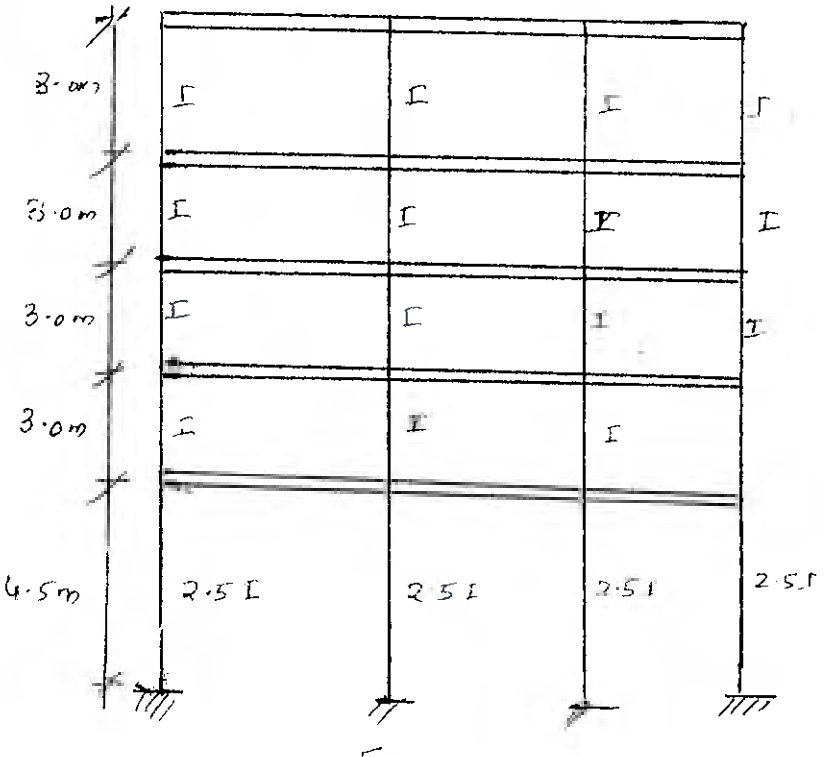


Fig 7

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End Semester EXAMINATION June 2024

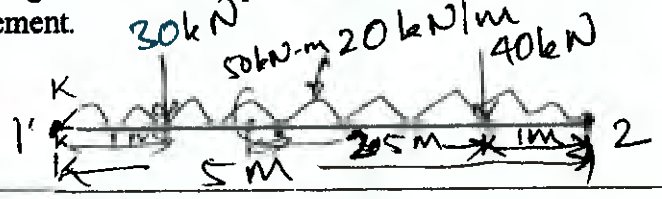
Program: M.Tech Structures Sem II 13/6/24 **Duration: 3 hr**

Course Code: PC-~~MST201~~ MTSE201 **Maximum Points: 100**

Course Name: Finite Element Analysis **Semester:** II

Notes:

1. Solve any 5 Questions
2. Assume data wherever necessary

Q.No.		Questions	Points	CO	BL
Q1	a	Derive [D] matrix for plane stress and plain strain elements.	10	1,2	2
	b	Write short note on CST element	05	1,2	2
	c	Derive shape function for 8 noded rectangular element using Lagrangian Formulation.	05	1	2,3
Q2a		Solve the following differential equation using i. Galerkins Method ii. Least Square Method iii. Point Collocation Method $\Phi'' - \Phi' = x$ Use Boundary Conditions $\Phi(x=0)=0$ and $\Phi(x=1)=1$	14	1	2
Q2b		Derive shape function for three noded line element.	06	1,2	2,3
Q3a		Write short notes on shape functions and their uses in finite element analysis	05	1,2	2,3
Q3b		Using FEA derive equivalent nodal force vector for following beam element. 	08	1,2	2,3
Q3c		Calculate the field variable x at a point P(s=L/3) for a line element with cubic interpolation function and also its first derivative at the same point ,given that {x}=[4 ,5 ,8 ,9]	07	1,2	2,3

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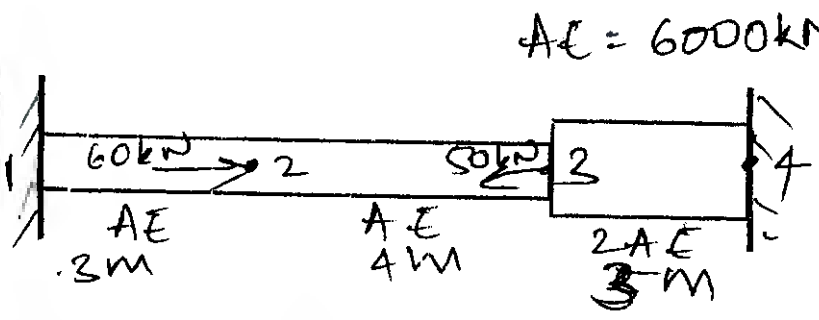
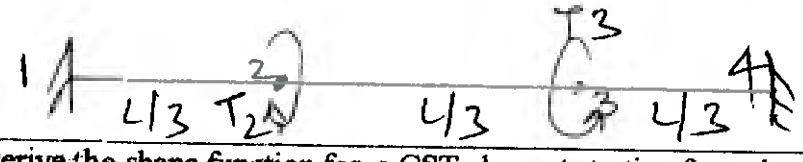
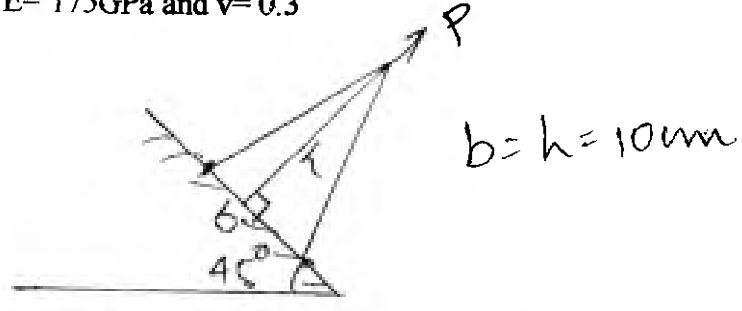
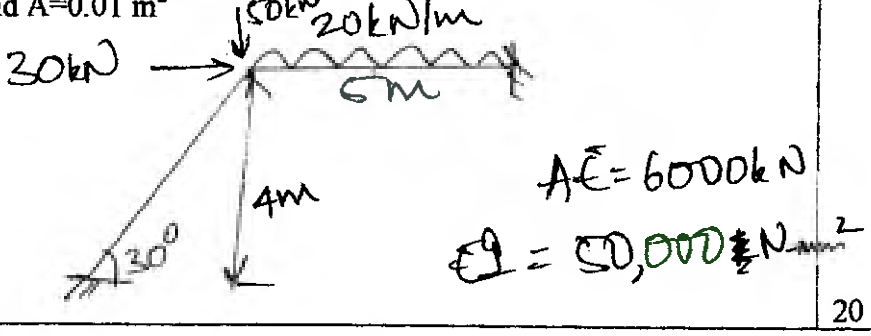
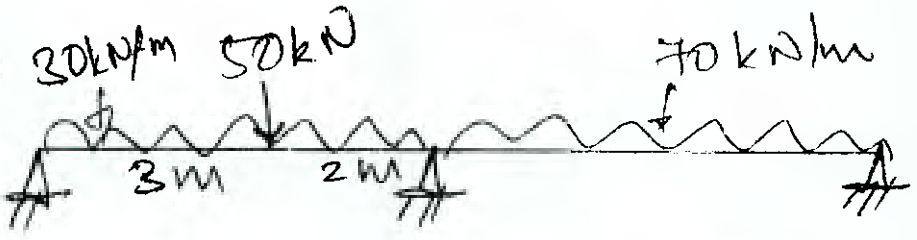
End Semester EXAMINATION June 2024

Q4a	For the three-bar assemblage shown in figure determine a) Assembled stiffness matrix b) displacement at point x (5 cm right of node 2) c) Reactions at nodes 1 and 4 	10	1,2	2,3
Q4b	A circular shaft is subjected to torques T2 and T3 as shown in the diagram.By employing one-dimension torsion elements compute angular roatations at nodes 2 and 3 and reactive torque at nodes 1 and 4 	10	1,2	2,3
Q5a	Derive the shape function for a CST element starting from the first principle.	08	1,2	2,3
Q5b	Two –dimensional model of an anchor plate of a communication towers guy cable is shown in the fig. The anchor consists of a triangular steel plate ,which is subjected to a force of 30kN.Analyse the anchor plate. Thickness of plate is 7mm.E= 175GPa and v= 0.3 	12	1,2	2,3
Q6	Analyse the plane frame shown in the fig using FEM. Consider E=200GPa ,I =10^{-4} m^4 and A=0.01 m^2 	20	1,2	2,3

End Semester EXAMINATION June 2024

Q7	Analyse beam system shown using FEM. $EI = 80,000 N\text{-}mm^2$ 	20	1,2	2,3

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End Semester Examination Sem II 2023-2024
June 2024

F.Y. B.Tech (Civil) Sem II 14/6/24

Total Marks: **100** Duration: **3 Hrs**
CLASS/SEM : **F.Y.B.Tech Civil Sem.-II** COURSE NAME : **ENGINEERING PHYSICS**

COURSE CODE: **BSBTC202** DATE: **14/06/2024**

- **Answer any FIVE questions out of SEVEN.**
- **Diagrams have to be drawn wherever necessary. Assume suitable data (if necessary) and state your assumptions clearly.**
- **Figures to the right indicate Mark, Module no, Course Outcome and Bloom's Taxonomy level respectively.**
- **Marks will be given on the basis of what will be written in the paper irrespective of your intentions!**

Good luck!

		Mark	MN	CO	BL
Q1.	**(20 mark)**				
a.	Find the wave vector and hence the momentum of the particles which come out as an output in a He-Ne laser.	**5**	1,5	1	3,5
b.	Sodium crystalises in a cubic structure. The edge of the unit cell is 4.3A°. The density of sodium is 963 kg/m^3 and its atomic weight is 23. What type of unit cell does sodium belong to?	**5**	3	3	3
c	A silicon optical fibre with a core diameter large enough has a core refractive index of 1.50 and a cladding refractive index 1.47. Determine(i) the critical angle at the core cladding interface, and the numerical aperture for the fibre.	**5**	5	5	3
d	Velocity of ultrasonic waves in mild steel is 5.9x10^3 m/s. The velocity of ultrasonic waves in brass calibrated for mild steel measured by an ultrasonic gauge meter is 4.8x10^3 m/s. If the thickness of brass plate measured by gauge meter is 12.8cm, calculate its real thickness.	**5**	4	4	3,5
Q2.	**(20 mark)**				
a.	Arrive at Schrodinger's time independent equation from its time dependent form.	**8**	2	2	2
b.	A He-Ne laser has an output power of 2.5mW. How many photons are emitted each milli second by this laser when operating?	**6**	5	5	3,5
c.	Derive an expression for interplanar spacing in parallel crystal planes in terms of Miller Indices.	**6**	3	3	3
Q3.	**(20 mark)**				
a.	Derive expressions for Numerical Aperture and Acceptance angle of Optical fibers.	**8**	5	5	3

b.	Evaluate the first three energy levels of an electron enclosed in a box of width 10A°. Compare it with those of a person of mass 80kg moving inside a potential well of width 1m. Comment on the results.	**6**	1	1	3
c.	2 ships are separated by a particular distance. Ultrasonic signals of frequency 150 kHz are sent from one ship to another through air and through water. Find distance between the ships and time required for the signal to travel through water. Given: velocity of the signal in air is 348 m/s and velocity in water is 1520 m/s and that the difference in times sent through water and air is 2s.	6	4	4	3
Q4.	**(20 mark)**				
a.	Explain HCP structure in detail mentioning clearly all the unit cell properties.	**8**	3	3	1, 3
b.	Evaluate the uncertainty in position of a particle if it has a wavelength corresponding to the wavelength output of a He-Ne Laser. Given: $\Delta\lambda$ is 0.69A°.	**6**	1&5	1 & 5	2,5
c.	An optical wire has light incident into the fiber from a liquid with an index of refraction of 1.33. If the index of refraction of the core is 1.58, what is the critical angle needed to achieve total internal reflection? Also calculate the Numerical aperture of the optical wire given that the fractional refractive index change is 0.05.	**6**	5	5	3,5
Q5.	**(20 mark)**				
a.	Explain construction and working of an Nd:YAG laser in detail.	**8**	5	5	1,2
b.	Copper has an FCC structure and atomic radius is 0.278nm. Calculate the interplanar spacing for (111) planes.	**6**	3	3	3
c.	Imagine an electron inside an infinite potential well of width 10A° in an energy state corresponding to the wavelength output of an Nd:YAG laser. Calculate the order of the excited state corresponding to this energy.	**6**	2&5	2	3,4
Q6.	**(20 mark)**				
a.	Explain the principle of working of a piezolectric oscillator in detail with a neat and labeled diagram.	**8**	4	4	3
b	Explain the working of a four level pumping scheme.	**6**	5	5	3
c.	Explain (with both mathematical and Physical reasoning) Heisenberg's Uncertainty Principle using the concept of a wave group.	**6**	1	1	3
Q7.	**(20 mark)**				
a.	Derive the Energy Eigen values and Eigen functions for a particle moving in an infinite height and of width L. Also sketch the probability function for the states n=1 and 2.	**8**	2	2	3
b.	Draw a diagram which clearly mentions important axes of a quartz crystal. Also mention different cuts of the quartz crystal.	**6**	4	4	3
c	Wavelengths can be determined with accuracies of one part in 10^8. What is the uncertainty in the position of a 1.5A° X-ray photon when its wavelength is simultaneously measured?	**6**	1	1	3,5