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11/4/22

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

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

End Semester Examination

April - 2022

M.Tech (Civil) in Struct. Engg) Sem I

Max. Marks: 100 Duration: 3 Hours

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

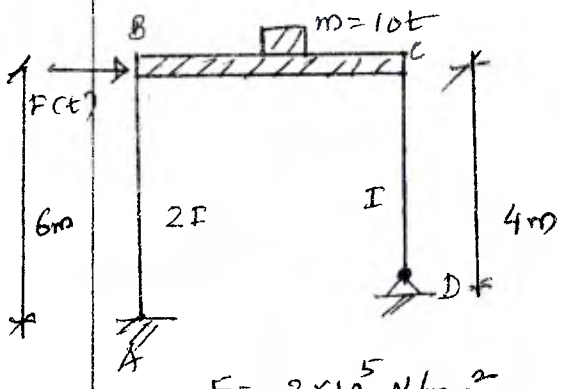
Name of the Course: Structural Dynamics Course Code : PC- MST 101

Instructions:

- Answer any five 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		Points	CO	BL	PI
Q1 (a)	What is dynamic load? Briefly explain how the analysis of structure to random of dynamic load is done.	3	1	1,2	1.2.1
Q1 (b)	Explain clearly, the difference between static and dynamic analysis of structure.	3	1	2	1.2.1
Q1(c)	Derive the expression for Transmissibility Ratio and briefly explain how vibration isolation can be achieved.	8	2	3	1.3.1, 1.4.1
Q1(d)	An SDOF system of mass **m** and stiffness **K** is found to vibrate with natural frequency ω = 75.4 rad/sec. If the stiffness is decreased by 1000 N/m, the natural frequency reduces by 50% of its original frequency. Determine the mass and stiffness for the original system.	6	2		
Q2 (b)	The frame shown in figure is subjected to a triangular pulse type load as shown in figure at girder level. Calculate the maximum horizontal displacement at girder level and maximum bending moment in column AB. The response	8	2	3	2.4.1

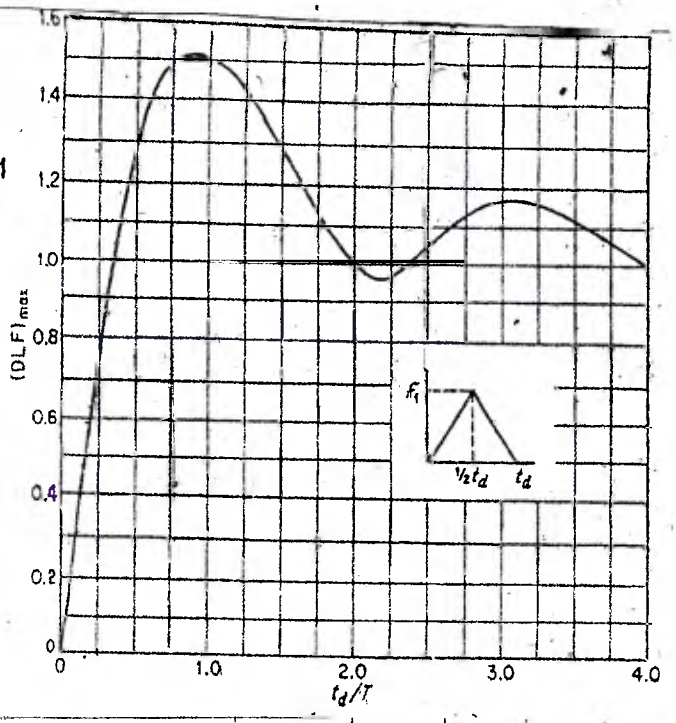
spectra for this dynamic load are also shown in the figure 1



$E = 2 \times 10^5\ N/mm^2$

$I = 20{,}000\ cm^4$

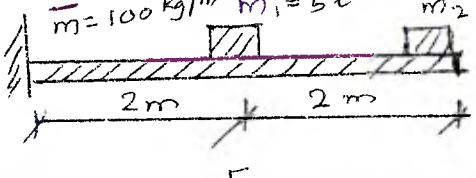
Figure 1



Q2(b)	For the rigid body system shown in figure:2 (a) Formulate the equation of motion (b) Determine the natural frequency and damping ratio	**12**	**2**	**3**	**1.3.1** **1.4.1**
Q3	A three storey single bay frame has storey height of **4 m.** The columns on ground and first story are **250 mm** wide **X 600 mm** deep while at 2nd story the size columns is **250 mm x 500 mm** & beams are very stiff. The mass on each and floor is **25 t. E = 20000 Mpa**. Calculate natural frequencies & mode shapes	**20**	**2**	**4**	**2.4.1**
Q4	A three story frame with free vibration characteristics as given below is subjected to a suddenly applied constant load **of 50 KN** at 2nd floor level and **100 KN** at the 3nd floor level. Calculate maximum displacements of each storey. Take damping ratio =**5%.** Also calculate the maximum bending moments in ground floor columns assuming **EI = 20, 000 KN-m²**	**20**	**2**	**4**	**2.4.1**

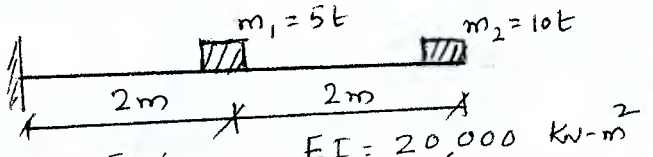
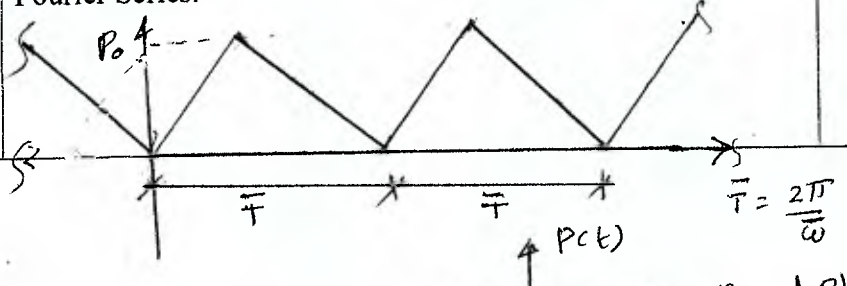
Story No.	Mass No.	Mass (t)	ω rad/sec	Mode shapes		
				Φ_{i1}	Φ_{i2}	Φ_{i3}
1	1	20	3.85	1.00	0.80	0.44
2	2	20	10.8	1.00	-0.56	-1.25
3	3	20	15.61	1.00	-2.25	1.80

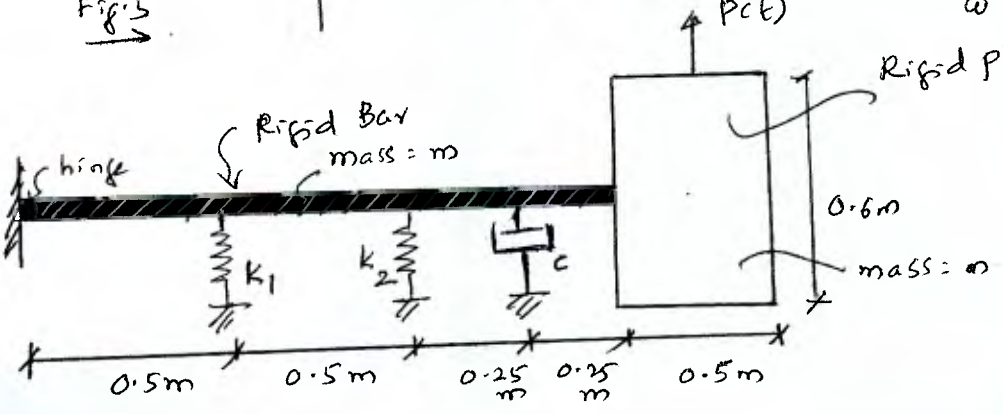
Q 5(a)	For the beam shown in figure3 calculate the fundamental frequency using Rayleigh's Method.	**8**	**2**	**3**	**2.4.1**



$EI = 20{,}000\ kN.m^2$

Figure 3

Q 5(b)	A simply supported beam of 8m span, 300 mm wide 600 mm deep carries a suddenly applied force of 100 KN at quarter span. Calculate the maximum displacement and bending moment responses under the load and shear force at left support. E= $2x10^4$ Mpa. and density of material = 2500 kg/m^3. Take contribution from the four lowest contributing modes	12	2	4	2.3.1 2.4.1
Q6(a)	For the cantilever beam shown in figure 4, calculate the natural frequencies and mode shapes.  Fig 4.	10	2	4	2.3.1
Q6(b)	If the beam referred in Q6(a) above , a suddenly applied constant load of 100 KN under second mass m_2, calculated the maximum reposes under each mass.	10	2	3	2.4.1
Q 7(a)	What is frequency domain method for analysis of dynamic response? Explain briefly.	4	3	2	2.4.1
Q 7(b)	What is complex frequency-response function? Explain briefly	3	3	2	2.4.1 2.2.1
Q 7(c)	Explain briefly the Fourier transform and inverse Fourier transform of the frequency function.	3	3	2	2.4.1 2.2.1
Q 7(d)	Represent the periodic load shown in figure 5 in terms of Fourier Series.  Fig 5	10	2,3	3	2.4.1 2.2.1



$m = 100\ kg$ $K_1 = 1000\ kN/m$ $K_2 = 600\ kN/m$

$C = 0.5\ N\text{-}s/m$ Figure -2 QNO. 2(b)

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Sardar Patel College of Engineering

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Munshi Nagar, Andheri (West), Mumbai – 400058.
End Semester Re-Examination
July - 2022

M.E. / M.Tech (Civil) with Str. Engg. Sem I

Max. Marks: 100 Duration: 3 Hours

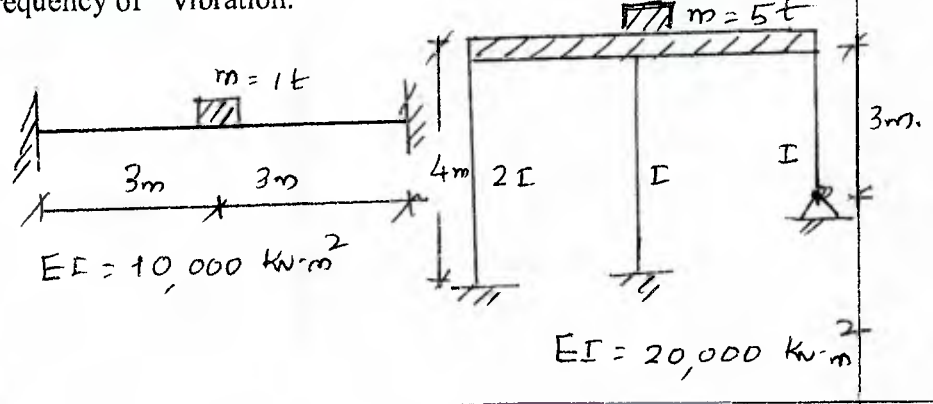
Class: M.Tech. Semester: ~~M~~ Sem I Program: Civil Engineering

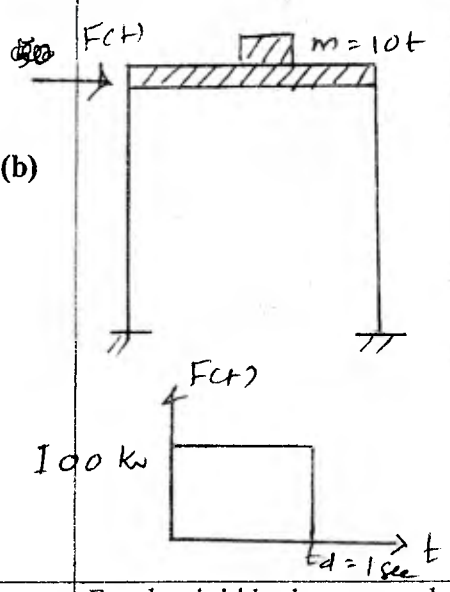
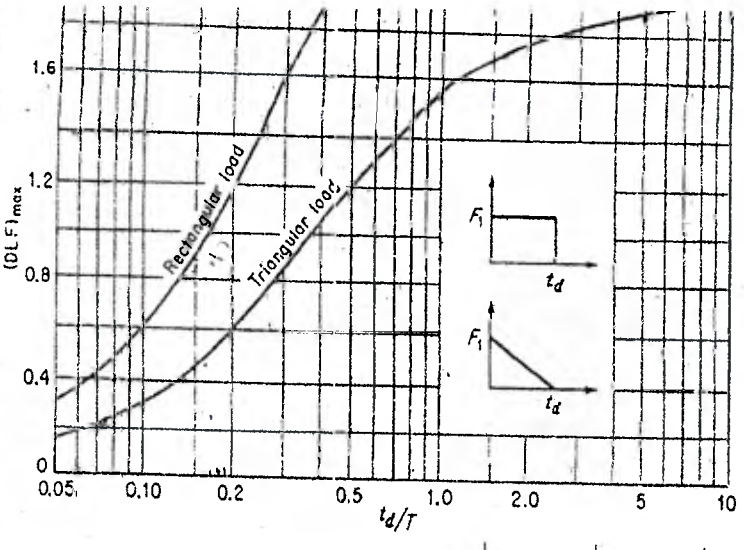
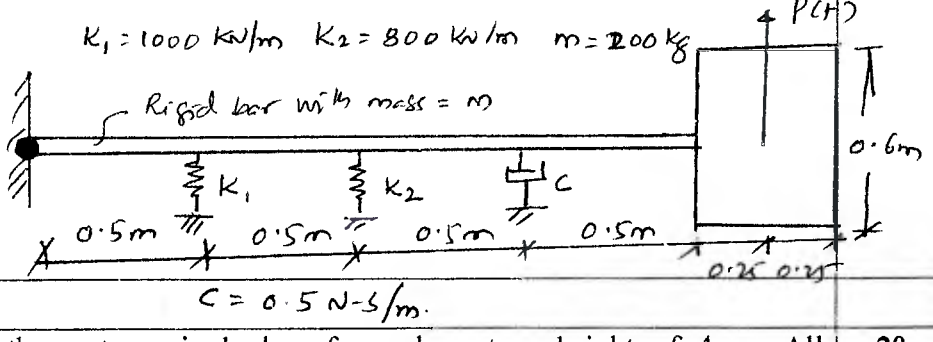
Name of the Course: Structural Dynamics Course Code : PC- MST 101

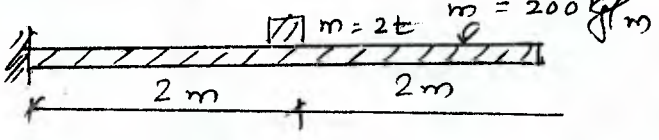
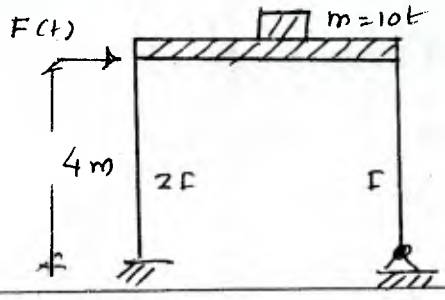
18/7/22

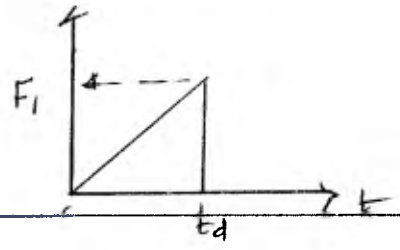
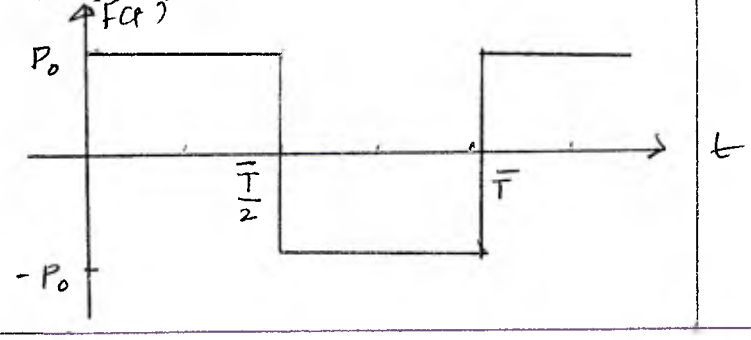
Instructions:

- Answer any five 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		Points	CO
Q1 (a)	What is dynamic load? Briefly explain the different types of dynamic loads with suitable example.	3	1
Q1 (b)	What is damping? State the effects of damping on structure	2	1
Q1(c)	For the structural systems shown in figure compute the natural frequency of vibration. 	8	2
Q1(d)	Derive the expression for Transmissibility Ratio and briefly explain how vibration isolation can be achieved.	7	2

Q2 (b)	The frame shown in figure is subjected to a rectangular pulse type load as shown in figure at girder level. Calculate the maximum horizontal displacement at girder level and maximum bending moment in column AB. The response spectra for this dynamic load are also shown in the figure.  	**8**	**2**
Q2(b)	For the rigid body system shown in figure: (a) Formulate the equation of motion (b) Determine the natural frequency and damping ratio 	**12**	**2**
Q3	A three story single bay frame has story height of 4 m. All columns are **300 mm wide X 600 mm** deep& beams are very stiff. The mass on each and floor is **25 t. E = 20000 Mpa**. Calculate natural frequencies & mode shapes	**20**	**3**
Q4	A three story frame with free vibration characteristics as given below is subjected to a suddenly applied constant load **100 KN** only at the 3nd floor level. Calculate maximum displacements of each storey. Take damping ratio =**5%.** Also calculate the maximum bending moments in ground floor columns assuming **EI = 20, 000 KN-m^2**	**20**	**3**

	Story No. / Mass No. / Mass (t) / ω rad/sec / Mode shapes Φ_{i1} Φ_{i2} Φ_{i3}: 1 / 1 / 30 / 4.92 / 0.336 / 0.759 / 1.0; 2 / 2 / 30 / 13.45 / -2.46 / -0.804 / 1.0; 3 / 3 / 30 / 18.7 / 1.58 / -1.157 / 2.58		
Q 5(a)	For the beam shown in figure calculate the fundamental frequency using Rayleigh's Method.  $E = 2 \times 10^5\ N/mm^2$ $I = 10^8\ mm^4$	8	4
Q 5(b)	A rigid steel frame shown in figure is subject to harmonic load with amplitude of load 100Kn and frequency 1.2 times the frequency of structure. Assuming the ratio as 2%, determine the maximum displacement at girder level.  $E = 2 \times 10^5\ N/mm^2$ $I = 20{,}000\ cm^4$	7	2
Q5(c)	A heavy table is supported by flat steel legs; its natural time period in lateral direction is 0.5 sec. When a 500N plate is clamped on its surface, the natural period is lengthened to 0.7 sec. what is the weight and effective lateral stiffness of the table	5	2
Q6 (a)	A two story frame with free vibration characteristics as given below is subjected to a harmonic force with amplitude 100 Kn and at frequency of 20 rad/sec. at the 2nd floor level. Calculate maximum displacements of each story. Take damping ratio =5% Floor No. / Mass (t) / Mode No. / ω, rad/sec / Mode Shapes Φ_{i1} Φ_{i2}: 1 / 20 / 1 / 14.58 / 1.0 / 1.481; 2 / 15 / 2 / 38.07 / 1.0 / -0.822	10	3
Q6(b)	For the pulse type force shown in figure, derive the expression for	5	2

	DLF. 		
Q6(c)	State and prove orthogonality principle. Also state the significance of orthogonality principle in dynamic analysis	**5**	**3**
Q 7(a)	What is frequency domain method for analysis of dynamic response? Explain briefly.	**4**	**5**
Q 7(b)	What is complex frequency-response function? Explain briefly	**3**	**5**
Q 7(c)	Explain briefly the Fourier transform and inverse Fourier transform of the frequency function.	**3**	**5**
Q 7(d)	SDOF system having natural frequency ω is subjected to square wave excitation as shown in figure. Determine the steady state response of the damped system. Take ω=5 , where is excitation frequency 	**10**	**2,5**

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SARDAR PATEL COLLEGE OF ENGINEERING

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Munshi Nagar, Andheri (W) Mumbai – 400058

M.Tech (Civil) in Structural Engg. Sem I

12/4/22

END SEM EXAMINATION APRIL 2022

Program: M.Tech- Structures

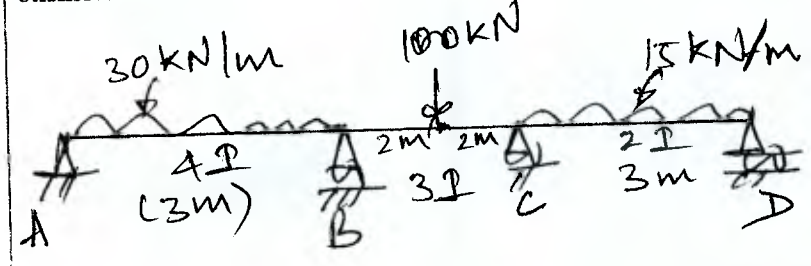
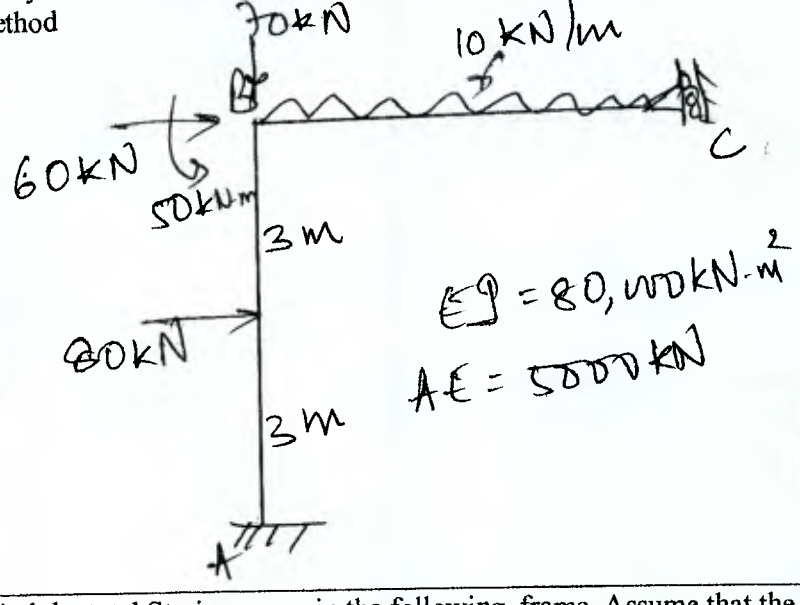
Duration: 3 Hrs

Course Code: PC-MST 102

Maximum Points: 100

Course Name: Advanced Structural Analysis

Semester:I

Q.No.	Questions	Points	CO	BL	PI
Q1	Analyse the following continuous beam using conventional stiffness method 	20	2	3	1.1.1, 1.3.1,1.2.1
Q2	Analyse the following plane frame using conventional stiffness method 	20	2	3	2.2.3, 3.1.4, 10.3.1
Q3a	Find the total Strain energy in the following frame .Assume that the frame has uniform rectangular cross section,200 mm wide and 400mm deep.E= 10^5 N/mm², ν=0.3.form factor=1.2	12	1	3	2.2.3, 3.1.4, 10.3.1

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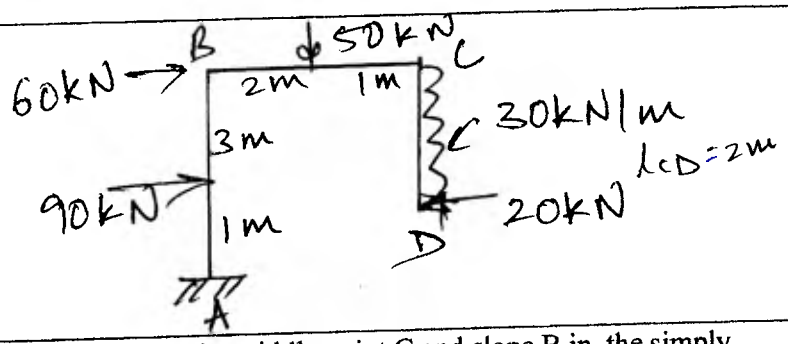
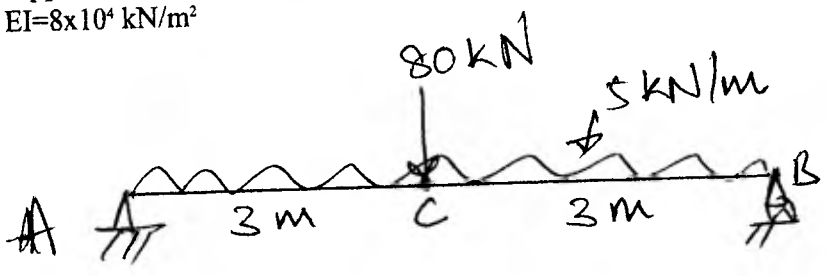
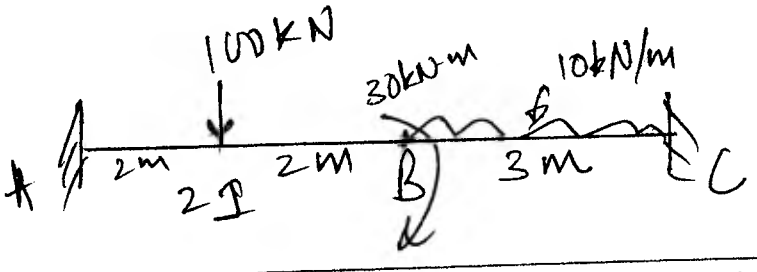
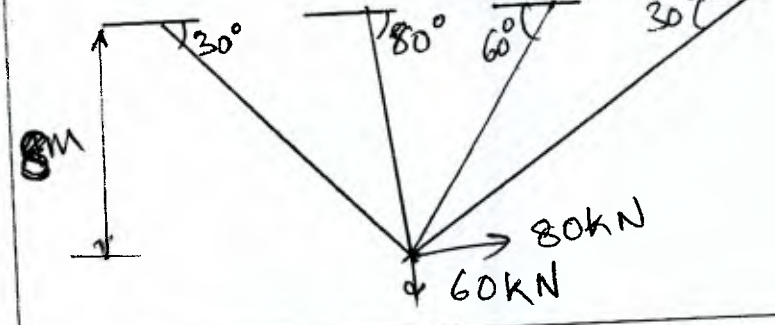
END SEM EXAMINATION APRIL 2022

					
Q3 b	Find deflection at the middle point C and slope B in the simply supported beam,loaded as shown in following figure. Assume $EI=8x10^4$ kN/m^2 	8	1	3	2.2.3, 3.1.4, 10.3.1
Q4	Analyse the following beam using Flexibility method. $EI = 60,000$ kN.m^2 	20	1	3	2.2.3, 3.1.4, 10.3.1
Q5	Derive the expression of deflection for the infinite beam on elastic foundation subjected to a concentrated load at midspan	20	4	3	2.2.3, 3.1.4, 10.3.1
Q6	A hook carries a load of 7.5kN and the load line is at a distance of 20mm from the inner edge of the section which is trapezoidal.The load line also passes through the centre of curvature of the hook. The dimensions of the central horizontal trapezoidal section are: inner width= 30mm;outer width=15mm;depth=30mm. Calculate the maximum and minimum stresses. Also plot the variation of stress across the section.	20	3	3	2.2.3, 3.1.4, 10.3.1
Q7	Analyse by stiffness method the pin jointed frame as shown in	20	2	3	2.2.3,

END SEM EXAMINATION APRIL 2022

	figure due to applied direct loads as well as due to lack of fit caused by bars 1 and 4 being too short by 5mm.Find complete force and displacement response. , $AE = 6000\ KN$ 				3.1.4, 10.3.1

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F. Y. M. Tech (Civil) with Str. Engg Sem I

Re Exam July 2022

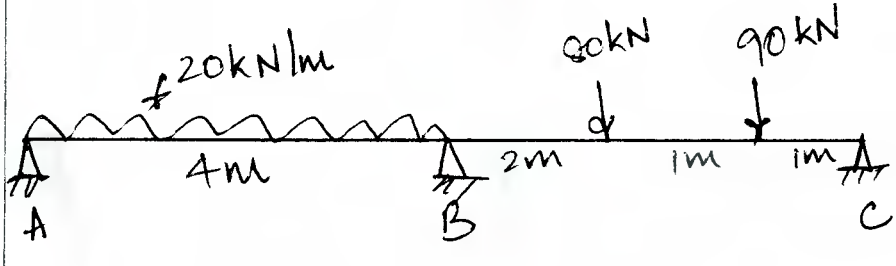
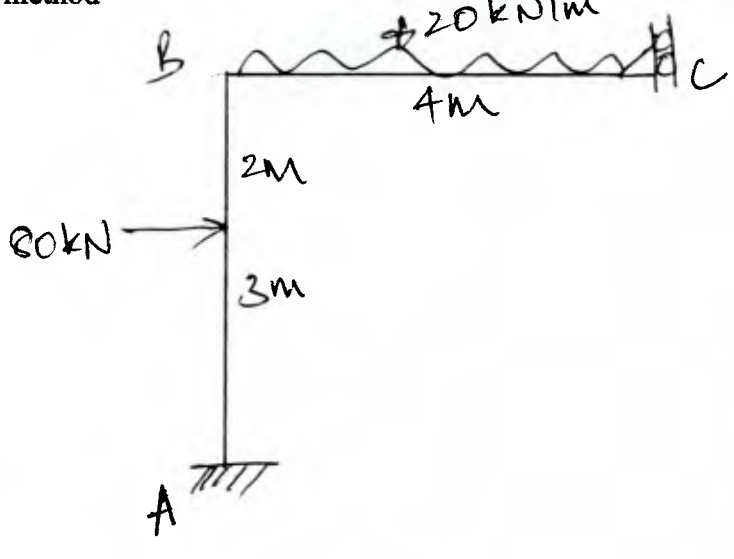
Program: M.Tech- Structures | **Duration: 3 Hrs**

Course Code: PC-MST 102 | **Maximum Points: 100**

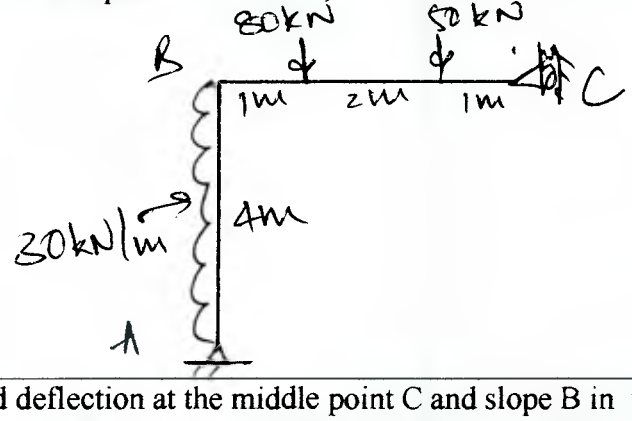
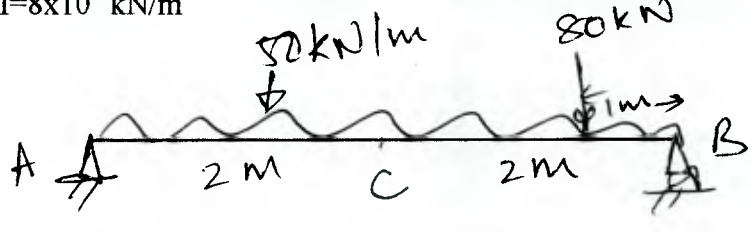
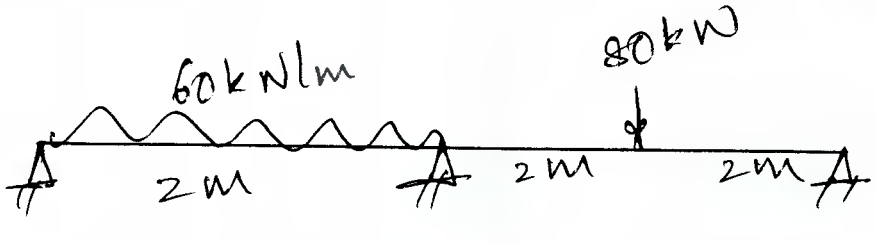
Course Name: Advanced Structural Analysis

Semester:I

19/7/22

Q.No.	Questions	Points	CO	BL	PI
Q1	Analyse the following continuous beam using conventional stiffness method 	20	2	3	1.1.1, 1.3.1,1.2.1
Q2	Analyse the following plane frame using conventional stiffness method 	20	2	3	2.2.3, 3.1.4, 10.3.1

Re Exam July 2022

Q3a	Find the total Strain energy in the following frame .Assume that the frame has uniform rectangular cross section,200 mm wide and 400mm deep.E= 10^5 N/mm^2 ,v=0.3.form factor=1.2 	12	1	3	2.2.3, 3.1.4, 10.3.1
Q3 b	Find deflection at the middle point C and slope B in the simply supported beam,loaded as shown in following figure. Assume EI=8x10^4 kN/m^2 	8	1	3	2.2.3, 3.1.4, 10.3.1
Q4	Analyse the following beam using Flexibility method. 	20	1	3	2.2.3, 3.1.4, 10.3.1

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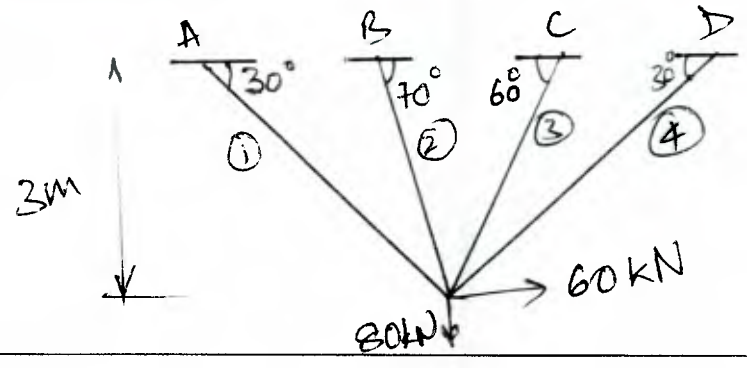
Re Exam July 2022

Q5	Derive the expression of deflection for the infinite beam on elastic foundation subjected to a concentrated load at midspan	20	4	3	2.2.3, 3.1.4, 10.3.1
Q6	A hook carries a load of 7.5kN and the load line is at a distance of 20mm from the inner edge of the section which is trapezoidal.The load line also passes through the centre of curvature of the hook. The dimensions of the central horizontal trapezoidal section are: inner width= 30mm;outer width=15mm;depth=30mm. Calculate the maximum and minimum stresses. Also plot the variation of stress across the section.	20	3	3	2.2.3, 3.1.4, 10.3.1
Q7	Analyse by stiffness method the pin jointed frame as shown in figure due to applied direct loads as well as due to lack of fit caused by bars 1 and 4 being too short by 5mm.Find complete force and displacement response. 	20	2	3	2.2.3, 3.1.4, 10.3.1

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination – April 2022

Program: M.Tech Civil Engineering - Structures Sem I **Duration: 3 Hours**

Course Code: EC-MST 105 **Maximum Points: 100**

Course Name: Design of Prestressed Concrete Structures **Semester: 1**

18/4/22

Notes:

- **Attempt any 5 main questions.**
- **Answers to all sub-questions should be grouped together**
- **Draw neat sketches wherever possible**
- **Assume suitable data if missing and state the same clearly.**
- **Use of IS 1343 is allowed**

Q.No.	Questions	Points	CO	BL	PI
1.a)	A simply supported prestressed I girder has flange dimensions as 2100x350mm and web dimensions as 300x1800mm. It is prestressed using a cable with parabolic profile, such that effective prestressing force is 1900kN. The cable is concentric at supports and has an eccentricity of 400mm at midspan. The girder supports a live load UDL of 10kN/m. Calculate the total stresses induced in the girder at midspan and supports by : a) Force Concept b) Stress Concept Also calculate the kern of the section.	10	1	3	1.4.1 2.3.2
1.b)	Explain in detail the difference between pre-tensioned and post-tensioned structures	05	1	1,2	2.2.4
1.c)	Explain the need of high strength materials in prestressed concrete structures	05	1	1,2	2.2.4
2.a)	Calculate the flexural capacity of a post-tensioned (bonded) I girder having the following properties: Flange = (1400x200)mm Web = (300x2000)mm Area of cables = 3000mm^2 fp = 1600MPa Effective depth = 2250mm fck = 40MPa	10	1	3	3.1.4

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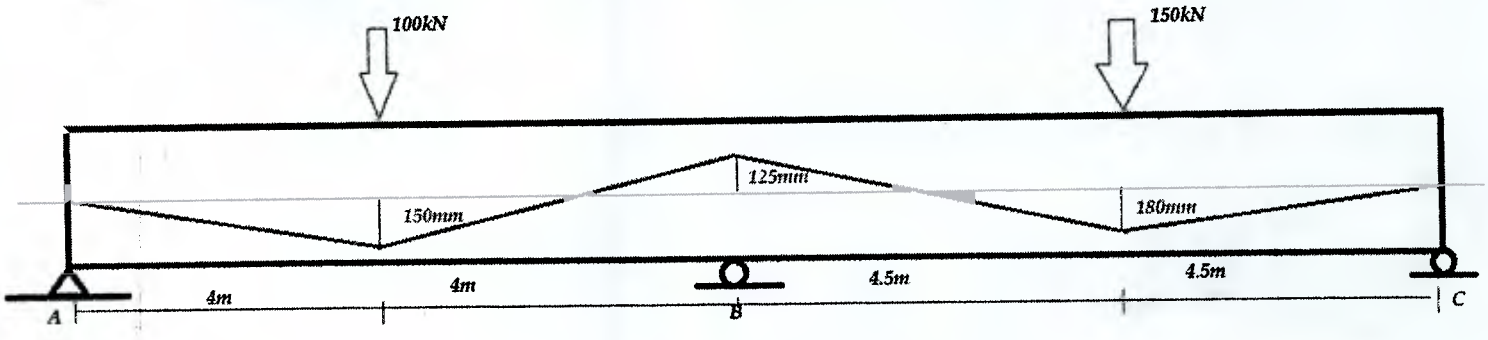
Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination – April 2022

<table>
<tr><td>2.b)</td><td>Design the shear reinforcement at quarter span for a simply supported beam of rectangular cross section 300mmx800mm and span 10m. It carries a live load UDL of 7kN/m(unfactored). It is prestressed by a straight cable that is having eccentricity of 200mm
fck = 40MPa
Effective prestress in cable = 1100MPa
Characteristic strength of PT steel = 1600MPa
Use Fe415 grade steel for reinforcement.</td><td>10</td><td>2</td><td>4</td><td>3.1.4</td></tr>
<tr><td>3.a)</td><td>A simply supported post tensioned beam of span 18m with 2 cables having a cross section of 300mmX 900mm is successively tensioned from a single end in the order of cables 1-2.
<table>
<tr><td></td><td>Profile</td><td>Eccentricity at midspan</td><td>Eccentricity at support</td></tr>
<tr><td>Cable 1</td><td>Parabolic</td><td>25mm (below N.A.)</td><td>150mm (above N.A)</td></tr>
<tr><td>Cable 2</td><td>Straight</td><td>350mm(below NA)</td><td>350mm(below NA)</td></tr>
</table>
Each cable has a cross section area of 300mm^2 and an initial tension of 1200MPa. Co-efficient for friction = 0.5; co-efficient for wave effect = 0.0015/m. Age of concrete at transfer of prestress = 28days. Anchorage slip = 4mm. Es = 210kN/mm^2,Ec = 30kN/mm^2.
Calculate the % losses due to elastic shortening, shrinkage, friction and anchorage slip</td><td>12</td><td>1</td><td>3</td><td>2.2.1</td></tr>
<tr><td>3.b)</td><td>Explain the concept of debonding of cables.</td><td>4</td><td>1,3</td><td>2</td><td>1.4.1</td></tr>
<tr><td>3.c)</td><td>Explain transmission length for pretensioned structures</td><td>4</td><td>1,2</td><td>2</td><td>1.4.1</td></tr>
<tr><td>4.</td><td>Design a Type 1 post tensioned bonded I girder (simply supported) for the following data :
Effective span = 20m
Live load = 18kN/m
fck = 40MPa
fci = 30MPa
Es = 210kN/mm^2
Ec = 31.6 kN/mm^2
Assumed loss % = 30%
Use 8mmϕ strands for cables. The characteristic strength of cables is 1500MPa. Calculate the size of section</td><td>20</td><td>2</td><td>4</td><td>3.1.4
3.2.1</td></tr>
</table>

	required, prestressing force, eccentricity with safe cable zone. Draw neat sketch of the cable profile				
5.a)	A 14m span simply supported composite beam consists of 300mmX700mm precast stem and a cast-in-situ flange of 600mmX400mm. The stem is a post tensioned unit subjected to an initial prestressing force of 900kN. %loss = 25%. The tendons are provided at 150mm from the soffit of stem. The beam has to support a live load of 10kN/m. Determine the resultant stress distribution in the beam if the beam is a) unpropped; b) propped	15	1	3	2.2.1 1.4.1
5.b)	Explain the effect of prestressing on shear resistance of sections	05	1,3	2	1.4.1
6.a)	A simply supported prestressed beam of cross section 350mmX800mm and span 12m has a straight profile of cable with eccentricity of 200mm below N.A. It carries a live load of 6kN/m. The area of cable is 500mm^2 and it is initially tensioned to 1450N/mm^2. Loss ratio = 0.75 Calculate the : i) Instantaneous deflection due to dead load + prestressing force ii) Long term deflection if the creep coefficient is 1.6 Es=210kN/mm^2; Ec =35kN/mm^2	10	1	3	2.2.1 1.4.1
6.b)	Design the end zone reinforcement for a pre-tensioned I-beam having flange of 200mmx60mm and web of 80mmx400mm. The initial prestress in 10 wires of 5mm diameter is 1300MPa and the wires have an effective eccentricity of 100mm. Assume the wires to be indented.	10	2	4	3.1.4 3.1.6
7.a)	The cable profile for a two span continuous beam is as shown in figure below. The prestressing force is 1500kN. Locate the pressure line due to prestressing force and the shown loads	20	3	4	2.3.2 1.4.1



Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

Re-exam - July 2022

F. Y. M.Tech (Civil) with Sp. Engg. Sem I

Program: M.Tech Civil Engineering - Structures

Duration: 3 Hours

Course Code: EC-MST 105

Maximum Points: 100

Course Name: Design of Prestressed Concrete Structures

Semester: 1

20/7/22.

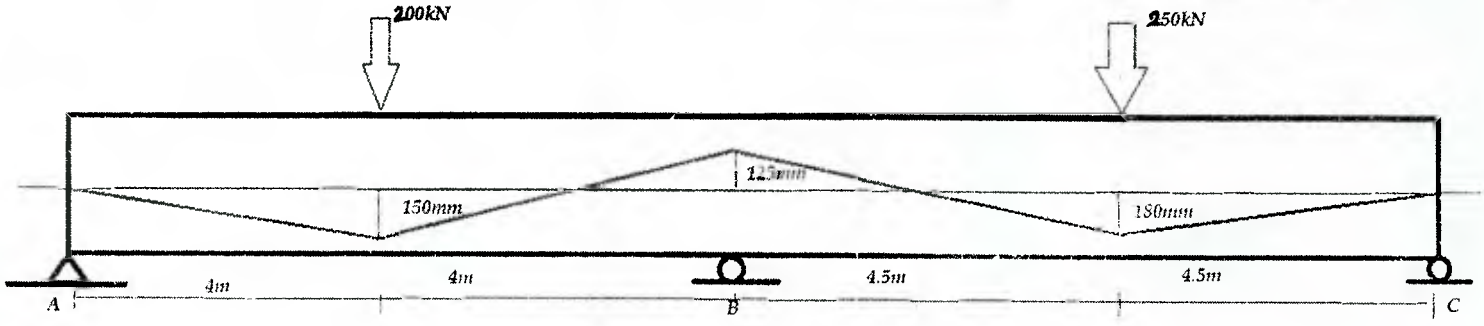
Notes:

- **Attempt any 5 main questions.**
- **Answers to all sub-questions should be grouped together**
- **Draw neat sketches wherever possible**
- **Assume suitable data if missing and state the same clearly.**
- **Use of IS 1343 is allowed**

Q.No.	Questions	Points	CO	BL	PI
1	a) What is pretensioning and post-tensioning? b) Explain how prestressing affects deflection of beams. What are the factors affecting long term deflection? c) Explain what do you mean by full prestressing, limited prestressing and partial prestressing. d) Calculate the stress in extreme fibres at support for a cantilever beam having 5m span, (250x500)mm cross section and supporting a UDL of 15kN/m on full span. It is prestressed with a straight cable having eccentricity 250mm above the CG.	20	1	1,2	2.2.4
2.a)	A pretensioned concrete beam of size 250 mm X 600 mm has an effective cover to tendon 200 mm. Area of prestressing steel is 565 mm2, fck = 40 N/mm2, fp = 1600 N/mm^2. Calculate the ultimate flexural strength of the section. fck = 40MPa	10	1	3	3.1.4
2.b)	Design the shear reinforcement ***at one third span*** for a simply supported beam of rectangular cross section 300mmx700mm and span 10m. It carries a live load UDL of 8kN/m(unfactored). It is prestressed by a straight cable that is having eccentricity of 250mm fck = 40MPa Effective prestress in cable = 1100MPa Characteristic strength of PT steel = 1600MPa Use Fe415 grade steel for reinforcement.	10	2	4	3.1.4

<table>
<tr><td>3.a)</td><td>a) A simply supported post tensioned beam of span 18m with 2 cables having a cross section of 300mmX 900mm is successively tensioned from a single end in the order of cables 1-2.
<table>
<tr><td></td><td>Profile</td><td>Eccentricity at midspan</td><td>Eccentricity at support</td></tr>
<tr><td>Cable 1</td><td>Parabolic</td><td>25mm (below N.A.)</td><td>0mm</td></tr>
<tr><td>Cable 2</td><td>Straight</td><td>350mm(below NA)</td><td>350mm(below NA)</td></tr>
</table>
Each cable has a cross section area of 350mm^2 and an initial tension of 1200MPa. Co-efficient for friction = 0.5; co-efficient for wave effect = 0.0015/m. Age of concrete at transfer of prestress = 28days. Anchorage slip = 4mm. Es = 210kN/mm^2,Ec = 30kN/mm^2.
Calculate the % losses due to elastic shortening, friction and anchorage slip
b) Calculate the stress in extreme fibres at mid span and support due to prestress and an imposed load of 10kN/m on full span</td><td>15</td><td>1</td><td>3</td><td>2.2.1</td></tr>
<tr><td></td><td>c)Explain the difference between shear resistance of a PSC beam as compared to that of an RCC beam</td><td>05</td><td>1,3</td><td>2</td><td>1.4.1</td></tr>
<tr><td>4.</td><td>Design a Type 1 pretensioned bonded girder (simply supported) for the following data :
Effective span = 14m
Live load = 18kN/m
fck = 40MPa
fci = 30MPa
Es = 210kN/mm^2
Ec = 31.6 kN/mm^2
Assumed loss % = 30%
Use 8mmϕ strands for cables. The characteristic strength of cables is 1300MPa. Calculate the size of section required, prestressing force, eccentricity with safe cable zone. Draw neat sketch of the cable profile</td><td>20</td><td>2</td><td>4</td><td>3.1.4
3.2.1</td></tr>
<tr><td>5.a)</td><td>A 14m span simply supported composite beam consists of 250mmX600mm precast stem and a cast-in-situ flange of 500mmX300mm. The stem is a post tensioned unit subjected to an initial prestressing force of 800kN. %loss = 26.5%. The tendons are provided at 150mm from the soffit of stem. The beam has to support a live load of 10kN/m. Determine the resultant stress distribution in the beam if the beam is a) unpropped; b) propped</td><td>20</td><td>1</td><td>3</td><td>2.2.1
1.4.1</td></tr>
</table>

	Draw neat sketches to show the variations of stresses at each stage				
6.a)	Derive the expression for deflection due to prestress when the profile is parabolic having zero eccentricity at ends and "e" at mid span for a simply supported beam A simply supported prestressed beam of cross section 450mmX1100mm and span 15m has a straight profile of cable with eccentricity of 400mm below N.A. It carries a live load of 5kN/m. The area of cable is 400mm^2 and it is initially tensioned to 1350N/mm^2. % loss = 28% Calculate the : i) Instantaneous deflection due to dead load + prestressing force ii) Long term deflection if the creep coefficient is 1.6 Es=210kN/mm^2; Ec =35kN/mm^2	10	1	3	2.2.1 1.4.1
6.b)	Design the end zone reinforcement for a pre-tensioned I-beam having flange of 200mmx60mm and web of 80mmx400mm. The initial prestress in 10 wires of 5mm diameter is 1300MPa and the wires have an effective eccentricity of 100mm. Assume the wires to be indented.	10	2	4	3.1.4 3.1.6
7.a)	The cable profile for a two span continuous beam is as shown in figure below. The prestressing force is 1250kN. Locate the pressure line due to prestressing force and the shown loads	20	3	4	2.3.2 1.4.1



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SARDAR PATEL COLLEGE OF ENGINEERING

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Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examinations- April 2022

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

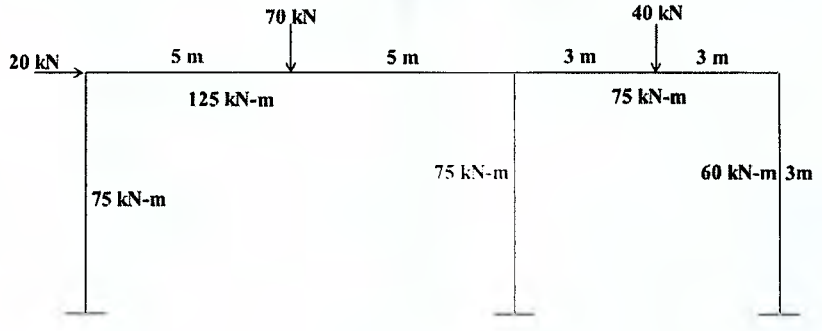
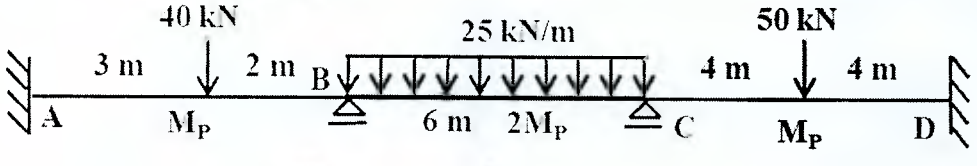
Course Code: EC-MST114 **Maximum Points: 100**

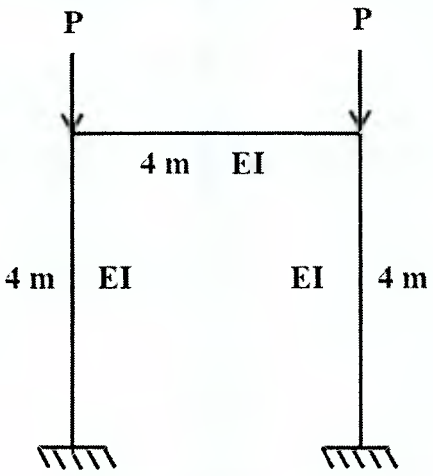
Course Name: Elective-II: Non Linear Analysis **Semester: I**

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.

Q.No	Questions	Points	CO	BL	PI
Q1(a)	State and explain uniqueness theorem.	(05)	1	1,2	1.3.1 2.1.3
Q1(b)	What are different methods of buckling? Explain.	(05)	3	2	1.3.1
Q1(c)	Explain the modes of buckling in case of a channel section symmetrical about X-axis.	(05)	4	2	1.3.1
Q1(d)	In case of lateral buckling of rectangular beam in pure bending, write the expression for critical stress and explain the terms involved in the expression.	(05)	4	1,2	1.3.1 2.1.3
Q2(a)	A propped cantilever of span 5 m is subjected to a udl of 20 kN/m on the entire span. Find the moment capacity of the beam required. Take load factor=1.5.	(10)	1	3,4	2.1.2
Q2(b)	Find the shape factor of an unsymmetrical I section with following details: Top flange width = 300 mm & thickness = 25 mm Bottom flange width = 350 mm & thickness = 25 mm Depth of web = 250 mm and thickness of web = 20 mm	(10)	1	3,4	2.1.3 2.2.3

Q3(a)	For the frame shown in figure below, find the collapse load factor. Loads shown in the figure are working loads and the plastic moment capacity of each member in kN-m is also shown in the figure.	(14)	1	3,4	2.1.3 2.2.3
					
Q3(b)	What are the advantages and disadvantages of plastic analysis over elastic analysis?	(06)	1	1,2	1.3.1 2.1.3
Q4(a)	A continuous beam is subjected to working loads as shown in figure below. If M_P = 75 kN-m, calculate the (true) load factor for the beam.	(10)	1	3,4	2.1.3 2.2.3
					
Q4(b)	Write a note on effect of shear force on plastic moment capacity of a flexural member.	(10)	2	1,2, 3	1.3.1 2.1.3
Q5(a)	A simply supported column of length L is under the action of a compressive load P. Find the critical load by finite difference method if the flexural stiffness of the member varies according to $EI(x) = EI_0 \quad 0 \le x \le L/3$ $= 2.5EI_0 \quad L/3 \le x \le 2L/3$ $= EI_0 \quad 2L/3 \le x \le L$	(10)	3	3,4	2.2.3 2.4.1
Q5(b)	Use energy method and find the critical load of the column given in Question No 5 (a) above.	(10)	3	3,4	2.2.3 2.4.1

Q6(a)	Determine the critical load for the frame shown in figure.	(15)	3	3,4	2.2.3 2.4.1
					
Q6(b)	What is a beam column? Explain.	(05)	3	1,2	1.3.1 2.1.3
Q7(a)	Derive the governing differential equation for the torsional buckling of column with symmetrical cross- section.	(14)	4	1,2, 3	1.3.1 2.1.3
Q7(b)	Write a note lateral buckling of beams.	(06)	4	1,2	1.3.1 2.1.3

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SARDAR PATEL COLLEGE OF ENGINEERING

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Munshi Nagar, Andheri (W) Mumbai – 400058

END SEMESTER RE-EXAMINATION JULY 2022

F.Y. M.Tech (Civil) with Str. Engg. Sem I

Program:F.Y.M.TECH (Structural Engineering) **Duration: 3 Hrs.**

Course Code:EC-MST 125 **Maximum Points: 100**

Course Name: Elective-III Advanced Solid Mechanics **Semester: I**

21/7/22

Note: Solve any FIVE. Assume suitable data if necessary.

Q.No.	Questions	Points	CO	BL
Q.1 a)	The state of stress at a point is given by the following array of terms: $\begin{bmatrix} 5 & 2 & 1 \\ 2 & 3 & 4 \\ 1 & 4 & 2 \end{bmatrix}$ KN/m^2. Determine Principal stresses and its direction.	10	1	3
Q.1 b)	The strain components at a point with respect to x,y and z coordinate system are: $(\varepsilon_x = 0.01,\ \varepsilon_y = 0.02, \varepsilon_z = 0.03,\ \gamma_{xy} = \gamma_{yz} = \gamma_{zx} = 0.016)$, if the coordinate axes rotate about z axis (vertical) through 30^0 in the clockwise direction, determine the new strain components.	10	1	3
Q.2 a)	Derive equilibrium equations for 2D state of stress and also derive stress-strain displacement relation in polar coordinate system.	10	2	3
Q.2 b)	What is the use of Airy's stress function explain in brief? Using Airy's stress function draw stress distribution for minimum three cases for polynomial equation given below. $\phi = \frac{Ax^5}{20} + \frac{Bx^4y}{12} + \frac{Cx^3y^2}{6} + \frac{Dx^2y^3}{6} + \frac{Exy^4}{12} + \frac{Fy^5}{20}$	10	3	3
Q.3 a)	Derive expressions for σ_x, σ_y *and* τ_{xy} for a cantilever beam loaded at the end. Also find strains in terms of displacements. A cantilever beam of 2 m length having rectangular cross section 80 x 120 mm. It is subjected to end load of 1.5 KN, calculate stress distribution at the fixed end using above expressions.	10	2	3
Q.3 b)	What is shear centre? Determine the position of the shear centre of the section shown below.	10	3	3

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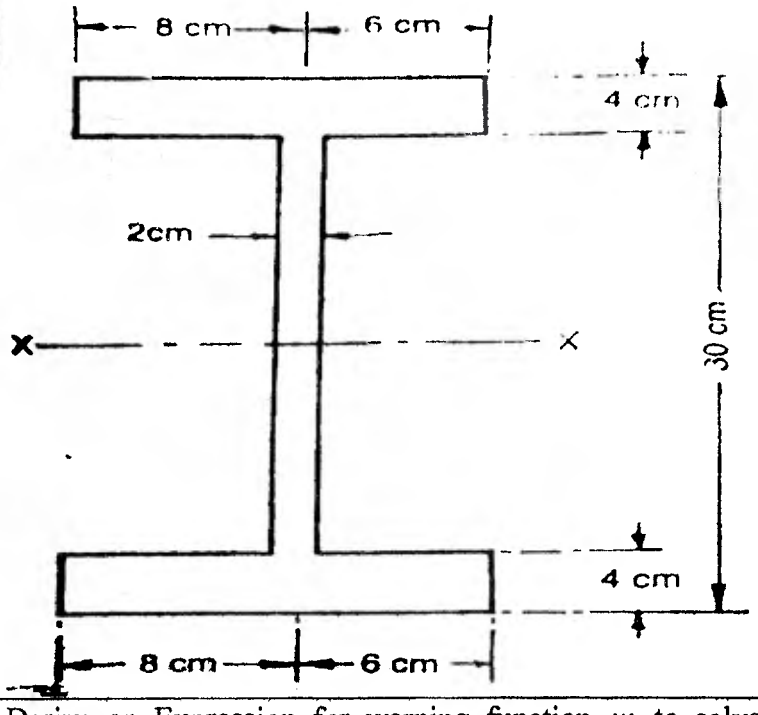
END SEMESTER RE-EXAMINATION JULY 2022

				
Q.4 a)	Derive an Expression for warping function ψ to solve the problems of torsion of prismatic bar. Using the expression find out resultant shear stress for circular and elliptical cross section.	14	2	3
Q.4 b)	Describe the idealized elasto-plastic stress strain curves of different material behaviour with neat sketches and their corresponding dynamic model.	6	3	3
Q.5	A simply supported beam subjected to uniformly distributed load, derive an expression for maximum normal and shear stresses using suitable stress function. Using above derived expressions determine the maximum stress distribution in the beam of C/S 60mm x 80mm subjected to UDL 2 KN/M. Take span of beam 3 m.	20	3	3
Q.6 a)	Explain in detail the stress-strain relationship to reduced 81 elastic constants to two elastic constants.	12	2	3
Q.6 b)	Explain in detail the theories of failure.	8	3	3

!!! ALL THE BEST !!!

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SARDAR PATEL COLLEGE OF ENGINEERING

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

END SEMESTER EXAMINATION APRIL 2022

Program:F.Y.M.TECH (Structural Engineering) Sem I **Duration: 3 Hrs.**

Course Code:EC-MST 125 **Maximum Points: 100**

Course Name: Elective-III Advanced Solid Mechanics **Semester: I**

Note: Solve any FIVE. Assume suitable data if necessary.

Q.No.	Questions	Points	CO	BL
Q.1 a)	The state of stress at a point for a given reference axes *xyz* is given by the following array of terms: $\begin{bmatrix} 150 & 80 & -60 \\ 80 & -120 & 50 \\ -60 & 50 & 80 \end{bmatrix}$ KN/m^2. Determine the tress components in the new coordinate system if new set of axes is formed by rotating *xyz* about *z*-axis in anticlockwise direction by 45^0. Also determine Principal stresses with respect to new stress components and direction for maximum principal stress.	12	1	3
Q.1 b)	The components of stress at a point are given by: $\sigma_x = 3x^2y^2 + 2x,\ \sigma_y = 5xyz^2 + 3y,$ $\sigma_z = x^2y + y^2z,\ \tau_{xy} = 0,\ \tau_{yz} = \tau_{xz} = 3xy^2z + 2xy.$ Determine whether these components of stress satisfy the equilibrium equations or not at the point (1, -1, 2). If not, then determine the suitable body forces required at this point so that these stress components become under equilibrium.	8	1	3
Q.2 a)	Derive the components of strain tensor from the deformation of the line element. Also obtained expressions for principal strain in terms of strain invariants.	12	1	3
Q.2 b)	Explain Airy's stress function. Using Airy's stress function draw stress distribution for minimum three cases for polynomial equation given below. $\phi = Ax^5 + Bx^4y + Cx^3y^2 + Dx^2y^3 + Exy^4 + Fy^5$	8	2	3
Q.3 a)	Derive expressions for σ_x, σ_y *and* τ_{xy} for a cantilever beam loaded at the end. Also find strains in terms of displacements. A cantilever beam of 2 m length having rectangular cross section 100 x 150 mm. It is subjected to end load of 2 KN, calculate stress distribution at the fixed end using above expressions.	12	2	3
Q.3 b)	Explain in detail the theories of failure.	8	3	3

Bharatiya Vidya Bhavan's

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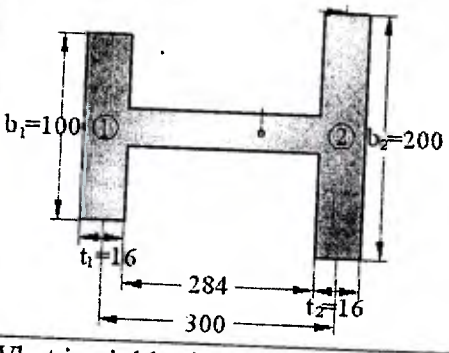
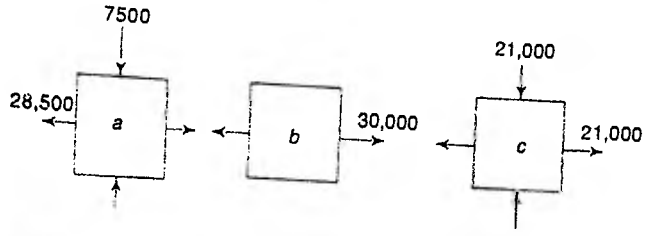
END SEMESTER EXAMINATION APRIL 2022

Q.4 a)	Derive expressions for σ_θ, σ_r *and* $'u'$ for thick-walled cylinder subjected to internal and external pressures considering plane stress problem. Draw stress distribution diagram for i) cylinder subjected to internal pressure only and ii) cylinder subjected to external pressure only.	12	3	3
Q.4 b)	Find the displacements along *xyz* axes for the prismatic bar suspended under self-weight using boundary conditions and stain displacement relationships.	8	3	3
Q.5 a)	If a bar subjected to couples applied at the end, using proper warping function derive expression for torsion which satisfy warping function and boundary conditions. Also find shearing stresses in case of elliptical cross section.	16	3	3
Q.5 b)	Describe the idealized elasto-plastic stress strain curves of different material behaviour with neat sketches and their corresponding dynamic model.	4	3	3
Q.6 a)	Define and explain importance of shear center. Also draw and mark shear center for cross section such as I , H, L (equal angle sec) sections. Also find location of shear center from the center of bigger flange for figure given below: 	10	3	3
Q.6 b)	What is yield criteria? Explain the Tresca and Von-Mises yield criteria for defining the yield surface. Figure shows three elements *a, b, c* subjected to different state of stress. Which one of these three will yield first according to (i) maximum stress theory, (ii)maximum strain theory (iii) maximum shear stress theory. Take Poisson's ratio 0.25 	10	3	3

!!! GOOD LUCK !!!

Bharatiya Vidya Bhavan's
SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

F.Y. M.Tech Sem I All Branches.

RE-EXAMINATION

Programme	MTech Structural Engineering	MTech Construction Management	MTech Power System and Power Electronics
Course Code	MC-PG01	MC-PG01	MC-MTPX101

Subject : Research Methodology and IPR
Total Marks :100
Class: MTech, Sem: I,

Duration : 3 Hours
22nd July, 2022

- **Solve Any Five Questions**
- Answers to all sub questions **must be** grouped together
- Figures to the right indicate full marks
- Assume suitable data wherever necessary

SN	Question statement	Points	Module	CO
Q1	Illustrate the following with examples wherever necessary. A. Z test B. Causal relationships Scatter Plot and Correlation analysis C. Writing a Literature survey paper D. Procedure to file patent	20	M1,M3, M4, M6, M7	CO3, CO4
Q2A	Design a Sample (with sample size n=88) based on optimum allocation using Cost Optimal Disproportionate sampling design for the following case. A population is divided into four strata so that N1 = 5500, N2 = 7500 and N3 = 6000, N4 =8500 Respective standard deviations are: s1=8, s2=9, s3=6, s4=12 . Costs in rupees to collect the strata are C1= 6000, C2=8500, C3=7000, C4= 7000.	10	M3	CO2
Q2B	Research Scholar conducted experimental research on concrete cubes, to study the influence of fly ash, GGBS and glass waste powder (GWP) individually, on the compressive strength of concrete. The cubes were casted for M30 grade of concrete and by random sampling method, tested after 28 days curing. For cubes in Group I, 30% fly ash was added, for Group II, 30% GGBS was added and in Group III, 30% GWP was added. The 28 days compressive strengths of cubes in N/mm^2 are given below. Check whether the mean compressive strength of the 3 different groups is same or not. Group I – 29, 35, 33, 28, 27, 32 Group II – 32, 33, 35, 29, 21 Group III – 35, 31, 28, 33, 34,36, 29	10	M5	CO2

<table>
<tr><td>Q3A</td><td>A data of 466 construction Projects was reviewed to know association between type of construction project and success of construction project. The response by Type of Project are as follows. At alpha =0.05 do these data suggest an association between Type of Project and being successful?
<table>
<tr><td></td><td>International Projects</td><td>Domestic Project</td><td>Total</td></tr>
<tr><td>Successful</td><td>39</td><td>74</td><td>113</td></tr>
<tr><td>Not Successful</td><td>172</td><td>181</td><td>353</td></tr>
<tr><td>Total</td><td>211</td><td>255</td><td>466</td></tr>
</table></td><td>10</td><td>M5</td><td>CO2</td></tr>
<tr><td>Q3B</td><td>State the Salient features of Chi Square Test.</td><td>10</td><td>M1, M5</td><td>CO1, CO2</td></tr>
<tr><td>Q4A</td><td>A manufacturer of Sport Shoes has been tracking the relationship between sales and advertising expenditure in dollars. Use linear regression to find out what sales might be if the company invested $71,000 in advertising next year.
<table>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>Sales $ (y)</td><td>160</td><td>172</td><td>183</td><td>185</td></tr>
<tr><td>Advertisement expenditure</td><td>52</td><td>67</td><td>69</td><td>73</td></tr>
</table></td><td>10</td><td>M1, M5</td><td>CO1, CO2</td></tr>
<tr><td>Q4B</td><td>How will you select a good research problem?</td><td>10</td><td>M1</td><td>CO1</td></tr>
<tr><td>Q5A</td><td>State the Guidelines to write the research article. Differentiate between Research Paper and Review paper.</td><td>10</td><td>M2, M3</td><td>CO1, CO2</td></tr>
<tr><td>Q5B</td><td>State the examples of Qualitative and Quantitative Research . Explain the difference in Qualitative and Quantitative Research.</td><td>10</td><td>M1, M2</td><td>CO1</td></tr>
<tr><td>Q6A</td><td>Write short note on
• Null Hypothesis and Alternate Hypothesis
• Type 1 error and Type 2 error
• Test Statistics
• Copyright and Trademark</td><td>10</td><td>M5 , M7</td><td>CO3, CO4</td></tr>
<tr><td>Q6B</td><td>State the Salient Features of IPR.</td><td>10</td><td>M4, M6</td><td>CO3, CO4</td></tr>
<tr><td>Q7A</td><td>Explain the following with suitable examples
• Limitations and advantages of Hypothesis Test
• Rejection Region
• Left Tail Test and Right Tail Test
• One Tail Test and Two Tail Test</td><td>10</td><td>M1</td><td>CO1</td></tr>
<tr><td>Q7B</td><td>Differentiate between F Test and T Test with suitable example.</td><td>10</td><td>M5</td><td>CO3</td></tr>
</table>

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Bharatiya Vidya Bhavan's
SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

END SEMESTER EXAMINATION 25/4/22

M.Tech Str in Civil Engg. Sem I

Programme	MTech Structural Engineering	MTech Construction Management	MTech Power Sytems and Power Electronics
Course Code	MC-PG01	MC-PG01	MC-MTPX101

Subject : Research Methodology and IPR
Total Marks :100 **Duration : 3 Hours**
Class: MTech, Sem:I, **25th April 2022**

- **Question 1 is compulsory**
- **Solve Any Four Questions from the remaining**
- Answers to all sub questions **must be** grouped together
- Figures to the right indicate full marks
- Assume suitable data wherever necessary

SN	Question statement	Points	Module	CO
Q1	Explain the following with suitable examples A. Guidelines for writing a Literature survey for a paper A. Statistical Hypothesis Test Procedures and the Criminal Trial Analogy B. Types of IPR and their significance C. Scatter Plot and Co-relation	20	M1,M3, M4, M6, M7	CO3, CO4
Q2A	A population is divided into four strata so that N1 = 8500, N2 = 4500 and N3 = 9500, N4 = 11500 Respective standard deviations are: s1=12, s2=14, s3=7, s4=6 . Costs in rupees to collect the strata are C1= 9000, C2=5000, C3=10000, C4= 12000. How should a sample of size n = 98 be allocated to the four strata, if we want optimum allocation using Cost Optimal Disproportionate sampling design?	10	M3	CO2
Q2B	Researcher conducted experimental investigations on concrete cubes, to study the influence of fly ash, GGBS and glass waste powder (GWP) individually, on the compressive strength of concrete. The cubes were casted for M30 grade of concrete and by random sampling method, tested after 28 days curing. For cubes in Group I, 30% fly ash was added, for Group II, 30% GGBS was added and in Group III, 30% GWP was added. The 28 days compressive strengths of cubes in N/mm^2 are given below. Check whether the mean compressive strength of the 3 different groups is same or not. Group I – 35, 29, 34, 35, 27, 29 Group II – 33, 29, 30, 29, 33 Group III – 34, 28, 29, 32, 33, 27, 28	10	M5	CO2

<table>
<tr><td>Q3A</td><td>A data of 450 construction Projects was reviewed to know association between type of construction project and success of construction project. The response by Type of Project are as follows. At alpha =0.05 do these data suggest an association between Type of Project and being successful?
<table>
<tr><td></td><td>International Projects</td><td>Domestic Project</td><td>Total</td></tr>
<tr><td>Successful</td><td>46</td><td>88</td><td>134</td></tr>
<tr><td>Not Successful</td><td>184</td><td>179</td><td>363</td></tr>
<tr><td>Total</td><td>230</td><td>267</td><td>497</td></tr>
</table></td><td>10</td><td>M5</td><td>CO2</td></tr>
<tr><td>Q3B</td><td>Manufacturer wants to test on the basis of sample size 35 determinations and at 0.05 and 0.01 levels of significance whether the thermal conductivity of a certain kind of plate is 0.34 units, as has been claimed. The mean of sample is 0.343. From the information gathered in similar studies , we can expect that the variability of such determinations is given by $\sigma = 0.01$. Assume any suitable data if necessary.</td><td>10</td><td>M1, M5</td><td>CO1, CO2</td></tr>
<tr><td>Q4A</td><td>A maker of golf shirts has been tracking the relationship between sales and advertising dollars. Use linear regression to find out what sales might be if the company invested $68,000 in advertising next year.
<table>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>Sales $ (y)</td><td>150</td><td>171</td><td>170</td><td>178</td></tr>
<tr><td>Advertisement expenditure</td><td>42</td><td>62</td><td>60</td><td>65</td></tr>
</table></td><td>10</td><td>M1, M5</td><td>CO1, CO2</td></tr>
<tr><td>Q4B</td><td>State the characteristics of Good research Problem</td><td>10</td><td>M1</td><td>CO1</td></tr>
<tr><td>Q5A</td><td>Differentiate between Research Paper and Review paper.
State the Guidelines to write the research article.</td><td>10</td><td>M2, M3</td><td>CO1, CO2</td></tr>
<tr><td>Q5B</td><td>Differentiate between Qualitative and Quantitative Research</td><td>10</td><td>M1, M2</td><td>CO1</td></tr>
<tr><td>Q6A</td><td>State the difference between Copyright Patent and Trademark</td><td>10</td><td>M5</td><td>CO3, CO4</td></tr>
<tr><td>Q6B</td><td>Draw the flow chart and explain the procedure to receive the patent.</td><td>10</td><td>M4, M6</td><td>CO3, CO4</td></tr>
<tr><td>Q7</td><td>Explain the following with suitable examples
• Null Hypothesis and Alternate Hypothesis
• Type 1 error and Type 2 error
• Test Statistics
• Confidence Level and p value
• Limitations and advantages of Hypothesis Test
• Rejection Region
• Left Tail Test and Right Tail Test
• One Tail Test and Two Tail Test</td><td>20</td><td>M1</td><td>CO1</td></tr>
</table>

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Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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

End Semester – April 2022 Examinations

M.Tech - Civil Engg in (Structs) 2021 Sem-I

Program: F Y M.Tech **Duration:** 3 Hours

Course Code: AU-PG 01 **Maximum Points:100**

Course Name: Project Planning and Management

Semester: I

Notes: 1. Answer any five questions.
2 All questions carry 20 points.

Q.No.	Questions	Points	CO	BL	PI
1	1.1 What are the attributes or skills that a Project Manager should have?	10	2	2	2.1.2
	1.2 Explain the three Project Quality Management processes	10	2	2	11.3.1
2	2.1 List out ten steps, in sequence, for the preparation of Civil Structural, Architectural Tender specification.	10	1	2	11.3.1
	2.2 Why is it important to issue a Civil, Structural, Architectural design basis for the project? List ten of the most important design requirements that should be contained in the design basis.	10	1	2	3.1.6
3	3.1 Explain the three fundamental components of a computer model used for structural analysis. What are the three stages in the process of computer analysis?	10	3	2	6.1.1
	3.2 List out at least ten steps, in sequence, in the designing of a complex plant steel structure	10	3	2	6.1.1
4	4.1 What is the difference in approach between Limit state (Load Factor) design and working stress design? In Limit state design what are the two key load conditions? What are the checks for each of these load conditions?	10	3	4	3.4.1

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End Semester – April 2022 Examinations

	4.2 Define degrees of freedom. Specify the degrees of freedom and the equilibrium conditions for a rigid body in two dimensions.	5	2	3	1.2.1
	4.3 Explain Strength, Stiffness, Stability and Ductility at the element and system levels.	5	2	3	11.3.2
5	Explain any three top emerging trends which are impacting the Construction industry today.	10	1	2	3.3.1
	5.2 In five areas, explain how structural engineers can overcome the challenges faced by the profession.	10	1	2	2.4.2
6	List out atleast ten points defining the scope of a contour and traverse survey for a project plot.	10	3	4	2.4.2
	6.2 Why is quantity/cost monitoring important during execution of a CSA item-rate contract? How is quantity monitoring done during the project execution?	5	3	5	1.3.1
	6.3 What are the main objectives of constructability reviews	5	4	2	11.3.1
7	7.1 In a soil investigation specification, describe five field tests you would specify along with the soil parameter each test would measure	10	3	2	3.2.2
	7.2 List six soil properties and four recommendations for pile foundations that you would ask for in the final geo-technical report.	10	2	3	3.4.2