Enroll No	

K.E.Society's

Rajarambapu Institute of Technology, Rajaramnagar

(An Autonomous Institute, affiliated to SUK)

End Semester Examination (2022)

M.Tech. Civil Structural Engineering, Sem- II

Q.P.Code
EB2540

Course Code: CES 1114 **Course Name**: Finite Elements Analysis

Day & Date: Tuur., 18/08/2022

Time : 2:30 to 5:30 pm. Max Marks: 100

Instructions: 1) All questions are compulsory

2) Figures to the right indicate maximum marks

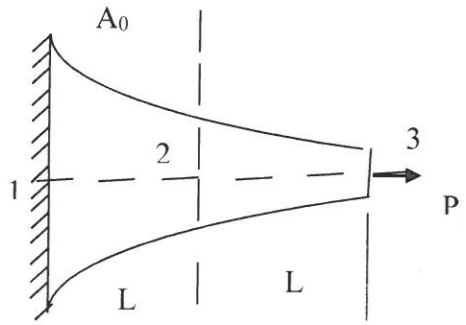
3) Assume suitable data if not given

4) Use of non-programmable calculator is allowed

Q.1 Solve the following

(a) Define displacement function and state its role in finite element method 3 CO_1

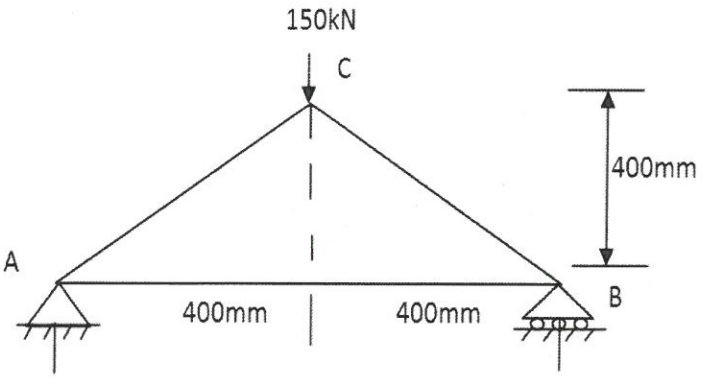
(b) Find deflection at node 2 and 3 and reaction at node 1 for bar as shown in Figure. Given $A(x) = A_0 e^{-\beta X}$ where $2\beta L = 1$. 12 CO_1



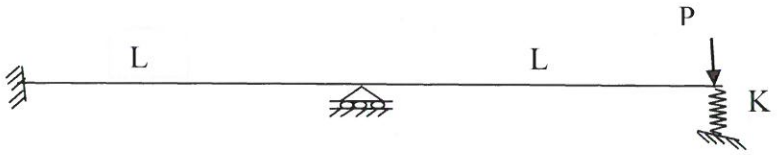
Q.2 Solve the following

(a) Determine the nodal displacement and stress in each member for three bar truss shown in the figure, Take E= 200GPa, c/s area for member AC = BC = 2000 mm^2 and AB = 1500 mm^2 15 CO_2

OR



(a) Analyze the beam loaded and supported as shown in the figure, by using finite element method. Take E = 210GPa, I = 2 x 10^{-4} m^4, k = 200 kN/m, L= 3m, P = 40kN. Assume EI = Constant — 15 — CO_2



Q.3 Solve the following

(a) Derive [B] matrix for QST element — 3 — CO_1

(b) Explain transformation of matrix and its necessity in FEA — 3 — CO_1

(c) Describe- Convergence and accuracy of FEM solutions — 9 — CO_1

Q.4 Solve any **Three**

(a) Explain the procedure of analysis of truss by using commercial software — 5 — CO_3

(b) Comment - How could we reduce stress and improve life of the component if failure of machine component is reported and the same is confirmed by FEA too. — 5

(c) Discuss how quality, accuracy and validity of results are checked of 2D elements in FEA — 5 — CO_3

(d) Write note on- Structure of FEA program — 5 — CO_3

Q.5 Solve the following

(a) State characteristics of shape function. Why polynomials are generally used as shape function? Derive shape functions for 4- noded rectangular element of size 2a x2b — 8 — CO_1

(b) Define axisymmetric problem and Develop element stiffness matrix [K] for any one axisymmetric element — 12 — CO_2

OR

(b) Formulate element stiffness matrix [K] using relationship between natural and Cartesian coordinate system in Isoparametric element — 12 — CO_2

Q.6 Solve the following

(a) What is the criteria for selection of displacement model for plate elements? also write the stress-strain relation for plate bending element — 4 — CO_2

(b) Derive element stiffness matrix [K] for rectangular plate element with 16 dof based on classical plate theory — 12 — CO_2

OR

(b) State assumption made in analysis of thin shell and Explain the element stiffness matrix formulation procedure for shell triangular element — 12 — CO_2

(c) List the difficulties in the developement of curved shell elements — 4 — CO_2

K. E. Society's

Rajarambapu Institute of Technology, Rajaramnagar

(An Autonomous Institute affiliated to SUK)

EB2552

ESE, 2022

First Year M. Tech Structural Engineering, Semester II

Course: Advanced Solid Mechanics, Course Code: CES 1124

Date & Day: Sat., 20/8/2022 Maximum Marks: 100

Time: - 2.30 to 5.30 PM.

Instructions: *1. All questions are compulsory.*

2. Use of non-programmable calculator is allowed.

3. Use any additional data required and mention it clearly

1	**a**	Derive the differential equation of equilibrium in z-direction, by considering the equilibrium of an infinitesimal rectangular element of size *dx dy dz*, in Cartesian coordinate system.	**06**	**CO1**
	b	The state of stress at a point be given by $\sigma_x = 100MPa$, σ_y = - $60MPa$, σ_z= $40MPa$, $\tau_{xy} = 80MPa$, $\tau_{yz} = \tau_{zx} = 0$. Consider another set of co-ordinate axes $x'y'z'$ in which z' coincides with z and x' is rotated by $30°$ anticlockwise from x' axis. Determine the stress components in the new coordinate system.	**09**	**CO1**
		OR		
	b	The state of stress at a particular point relative to xyz coordinate system is given by the stress tensor $\tau_{ij} = \begin{bmatrix} 150 & 100 & -100 \\ 100 & 100 & 0 \\ -100 & 0 & 400 \end{bmatrix}$ MPa Determine the normal stress and shear stress on a surface intersecting the point and parallel to the plane given by the equation 2x – y + 3z = 15..	**09**	**CO1**
2	**a**	Distinguish clearly between plane stress and plane strain problem.	**06**	**CO1**
	b	The displacement field in a body is specified as: $u_x = (x^2+3)10^{-3}$, $u_y = (3y^2z)10^{-3}$, and $u_z = (x+3z)10^{-3}$. Determine the strain components at (1, 2, 3). Check whether the compatibility conditions are satisfied.	**09**	**CO1**
3	**a**	For the state of strain specified below, determine the stress components at a point in a continuum assuming the values of E = 2×10^5MPa and υ = 0.3. ε_x = 0.0005, ε_y = - 0.0003, ε_z = 0, γ_{xy} = 0.0002, γ_{yz} = - 0.0004,aaa γ_{zx} = 0.0001.	**06**	**CO1**
	b	Investigate what problem of plane stress is represented by the function, $\frac{3F}{4h}\left(xy - \frac{xy^3}{3h^2}\right) + \frac{P}{2}y^2$ where, h is half depth of the beam, and F as the concentrated load.	**09**	**CO1**
4	**a**	A hollow aluminum thin walled rectangular tube is designed with outer dimensions 100mm x 50mm and wall thickness 6mm. The permissible shear stress is 35MPa and permissible angle of twist is 1.1^0. State whether this shaft can carry twisting moment of 2.352kNm safely? Take G=$1.575\text{x}10^5$MPa.	**08**	**CO2**

	b	What is membrane analogy? Derive the expression $\frac{T}{\theta} = GI_p$ for circular cross section subjected to torque 'T' by membrane analogy.	**07**	**CO2**
5	**a**	Compare and comment on Tresca's yield criterion and von-Mises yield criterion.	**08**	**CO1**
	b	The state of stress at a point is given by $\sigma_x = 70MPa$, $\sigma_y = 120MPa$, $\tau_{xy} = 35MPa$. If the yield strength for the material is $125MPa$, determined in a uniaxial tensile test, whether yielding will occur according to Tresca's and von-Mises yield conditions or not.	**12**	**CO1**
6	**a**	A thick cylinder of internal radius 80mm and external radius 160 mm is subjected to an internal pressure 'p' N/mm^2. If the yield stress for the cylinder material is 225 N/mm^2, determine a) The pressure at which the cylinder will start yielding just at the inner radius, b) The stresses when the cylinder has a plastic front radius of 150 mm and c) The stresses when whole of the cylinder has yielded. Draw stress distribution diagram. Assume von-Mises or Tresca yield condition.	**12**	**CO3**
		OR		
	a	A simply supported rectangular beam of span 3 m, having linear stress-strain behavior is 60mm wide and 80mm deep. It is 2.5m long and carries a uniformly distributed load over the entire span. The load is increased so that the outer 20mm depth of the beam yields plastically. If the yield stress for the beam material is 250N/mm^2, plot the residual stress distribution in the beam.	**12**	**CO3**
	b	Determine the shape factor for T-section having overall depth 100**mm**, width of flange 150**mm** and thickness of flange and web 10**mm**.	**08**	**CO3**

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K.E.Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Autonomous Institute, affiliated to SUK)
End Semester -Examination (Summer 2021-22)
M.Tech. Civil Structural Engineering
Sem- II **Course Code**: CES1134
Course Name: P.E.-II Advanced Earthquake Engineering

Q.P.Code
EB2564

Day & Date: ..Mon., 22/8/2022
Time: ..02.30..to..5.30..pm. Max Marks: 100

Instructions: 1) All questions are compulsory
2) Figures to the right indicate maximum marks
3) Assume suitable data if not given
4) Use of non-programmable calculator is allowed

Q.1

(a) Explain the reasons for the poor performance of masonry buildings in seismic area. List provisions given in IS 4326 for good performance of masonry buildings in seismic area. — 08 — CO2

(b) Explain the behavior of the following two masonry walls in seismic regions. — 08 — CO2
- i) Unreinforced masonry walls,
- ii) Reinforced masonry walls,
- iii) In-filled walls.

Q.2

(a) Explain with example design steps of elevated circular water tank as per IS 1893 provisions. — 16 — CO4

Q.3

(a) A fixed ended RC beam of rectangular section has to carry a distributed live load of 20kN/m in addition to its own weight and a dead load of 25kN/m. The maximum bending moment and shear force due to the earthquake are 60kN/m and 40kN respectively. C/C distance between supports is 6.0m. Design beam for ductility as IS 13920 2016 using M20 grade concrete and Fe 415 steel. — 16 — CO2

Q.4 Explain in detail with sketch any two — 16

(a) Discontinuity in force path. — CO5

(b) Dampers — CO5

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	(c)	Soft storey effect.		CO3
	(d)	Captive column effect.		CO3
Q.5				
	(a)	Explain different methods of computing transverse vibrations of a beam or shaft with UDL load.	09	CO3
	(b)	A uniform steel beam 2m long is simply supported at its ends and carries loads of 2000N at a distance of 500mm from each support. Calculate the lowest natural frequency for a system by any suitable method if the mass of beam itself neglected. Take I= $2x10^5$ mm^4, E= $2x10^5$ N/mm^2.	09	CO3
Q.6.		Explain the following Any Two	18	CO5
	(a)	Isolating devices.		
	(b)	Energy dissipating devices.		CO3
	(c)	Vibration controlling devices/ Techniques.		

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Enroll No	

K.E.Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Autonomous Institute, affiliated to SUK)
End Semester Examination (July/Aug 2022)
F.Y.M.Tech. Civil Structural Engg. Sem-II

Q.P.Code
EB2576

Course Code: CES1164 **Course Name**: PE-IV Design of Pre stress Concrete Structures

Day & Date: Wednesday, 24/08/2022
Time : 2:30pm to 5:30pm Max Marks: 100

Instructions: 1) All questions are compulsory
2) Figures to the right indicate maximum marks
3) Assume suitable data if not given
4) Use of non-programmable calculator is allowed

Q.No.	1 a)	A pre-stressed concrete beam 250mm wide and 375 mm deep is pre-stressed by concentrically placed tendon. The span of the beam is 8m, and the beam has to support an imposed load of 4.25kN/m. Find the pre-stressing force necessary so that tension is just avoided at the soffit of the mid-section. If however, the tendon is provided at an eccentricity of 65mm, find the pre-stressing force necessary so that tension is just avoided at the soffit of the mid-section. Concrete weights 24 kN/m3.	10	CO2
		OR		
		A simply supported pre-stressed concrete beam of cross section 300mm X 500mm covers a span of 12m. It is subjected to an uniformly distributed load of 20 kN/m without its self-weight and is pre-stressed with force of 1580 kN with a pre-stressing cable of parabolic profile. The cable is anchored at the center of gravity of the cross section at the support section and has a dip of 120mm at the middle cross section. Analyze the beam for the effects of pre-stressing at mid span using the stress and load balancing concept. Also draw stress distribution diagrams at mid span.		
	1 b)	Compare the pre-stressed concrete structures with RCC structures.	05	CO2
Q.No.	2 a)	A concrete beam of rectangular section, 100mm wide and 300mm deep is prestressed by five wires of 7mm diameter located at an eccentricity of 50mm, the initial stress in the wires being 1200 N/mm2. Estimate the loss of stress in steel due to creep of concrete using the ultimate creep strain method and the creep coefficient method. Use following data Es = 210 kN/mm2, Ec = 35 kN/mm2, εcc = 41 X 10-6 mm/mm per N/mm2, άe = (Es / Ec) = 6	10	CO1
	2 b)	Explain different types of post-tensioning losses in detail.	5	CO1

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Q.No. 3 A prestressed concrete beam 300mm wide and 800mm deep is subjected to an effective prestressing force of 1400kN along the longitudinal centroidal axis. The cable may be assumed to be symmetrically placed over mild steel anchor plate in an area 200mmX400mm. Design the end block. 15 CO3

OR

Design a pretensioned beam for the following data:

Effective span (Simply Supported) : 5.8m

Applied load : 5.1 kN/m

Concrete cube strength fcu : 50 N/mm2

Concrete cube strength at transfer fci : 30 N/mm2

Tensile strength of concrete ft : 1.7 N/mm2

Loss ratio η : 0.8

Permissible stresses :

At Transfer, Compressive stress fci = 15 N/mm2 and Tensile stress ftt= 1 N/mm2

At Working load, Compressive stress fcw = 17 N/mm2 and Tensile stress ftw= 0 N/mm2

High tensile steel wires, 7mm diameter with an ultimate tensile strength fpu = 1600 N/mm2 are available for use. The safe stress in the steel wires is 1200 N/mm2. The suggested sections with preliminary dimensions are given in following figure no. 1. Weight of prestressed concrete = 24 kN/m3.

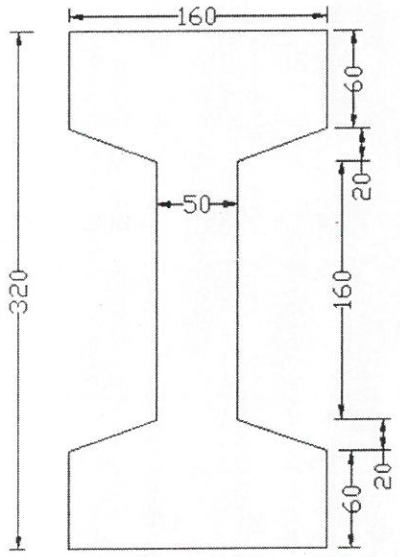

Figure - 1

Q.No. 4 The cable profile for two span continuous beam is as shown in following fig.2, the prestressing force being 1200kN. Find or Locate the pressure line due to the prestressing force alone. 15 CO5

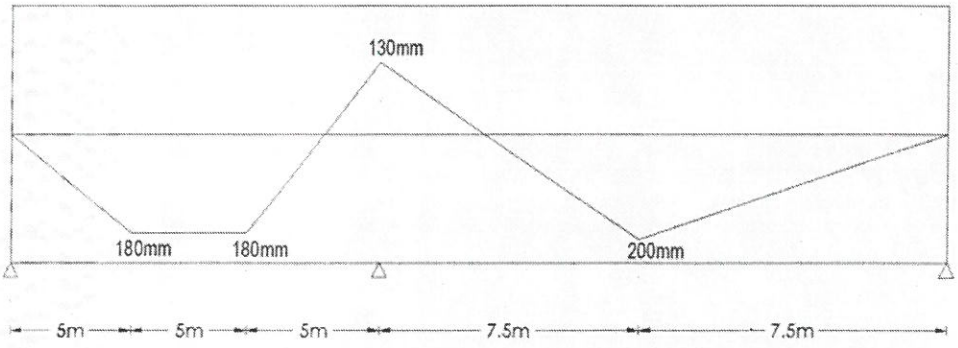

Figure 2

Q.No. 5 a) A prestressed cylinder pipe is to be designed using a steel cylinder of 1000mm internal diameter and thickness 1.6mm. The circumferential wire winding consists of 4mm high tensile wire, initially tensioned to a stress of 1000 N/mm2. Ultimate tensile strength of the wire=1600 N/mm2. Yield stress of steel cylinder= 280 N/mm^2. The maximum permissible compressive stress in concrete at transfer is 14N/mm2 and no tensile stresses are permitted under working pressure of 0.8 N/mm2. Determine the thickness of concrete lining required, the number of turns of circumferential wire winding and the factor of safety against bursting. Take modular ratio (m) = 8. 10 CO5

OR

Design a free edge water tank of diameter 36 metre to store water to a depth of 5 metre. Assume ultimate stress in steel is 1500 N/mm^2. Stress in steel at transfer is 70% of the ultimate stress. Safe stress in concrete in compression at transfer is 0.5 f_{ck}. Compressive stress in concrete at service condition is 0.1 f_{ck}. Final stress in steel is 0.8 X stress in steel at transfer. Modular ratio = 5.5 f_{ck} = 45 N/mm^2.

5 b) Design a free edge water tank of diameter 30 meter to store water to a depth of 8 meter. 10 CO4
Assume ultimate stress in steel = 1400 N/mm2.
Stress in steel at transfer = 75% of the ultimate stress.
Safe stress in concrete in compression at transfer = 0.5 fck .
Compressive stress in concrete at service condition = 0.1 fck..
Final stress in steel = 0.8 X Stress in steel at transfer.
Modular ratio = 5.3.
fck = 50 N/mm2.

Q.No. 6 Following fig.3 shows the cross section of a 8.5m span composite beam which consist of a 150mm X 300mm precast stem and cast-in-situ flange 450mm X 100mm. 20 CO4

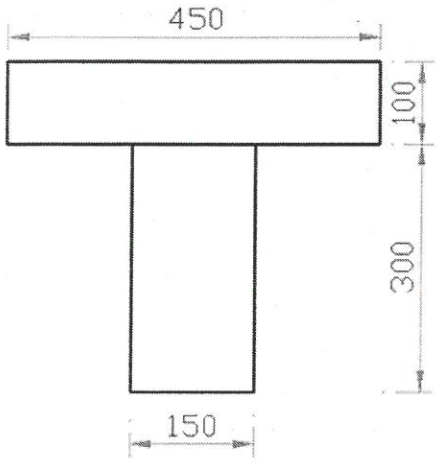

Figure 3 (All dimensions are in mm)

The stem is a post tensioned unit which is subjected to an initial prestressing force of 245 kN. The loss of prestress is 18%. The tendons are provided such that their center of gravity is 100mm above the soffit. The composite beam has to support a live load of 4.5 kN/m. Determine the resultant stresses in the stem and flange if the beam is unpropped. Modulus of elasticity for precast unit and the flange as 30 kN/mm2 and 30 kN/mm2 respectively. Weight of flange are well as stem concrete is 25 kN/m3.

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Rajarambapu Institute of Technology, Rajaramnagar

(An Autonomous Institute, affiliated to SUK)

End Semester Examination Aug 2022, Sem- II

Course Code: CES 1184

Course Name: Reserch Methodology & IPR

Q.P.Code
EB2587

Day & Date: Friday, 26/08/2022

Time : 2:30 to 4:30 pm.

Max Marks: 50

Instructions: 1) All questions are compulsory

2) Figures to the right indicate maximum marks

3) Assume suitable data if not given

4) Use of non-programmable calculator is allowed

Q 1 a	Explain with example different types of research design.	06	CO1
b	Explain process of finding gap analysis	06	CO1
	OR		
b	Compare selection criteria for various types of hypothesis in research	06	CO2
Q 2 a	Justify with example "ethics in research"	07	CO2
b	Compare methods of collecting primary and secondary data	06	CO2
	OR		
b	Explain suitability and use of sampling design in research	06	CO2
Q 3 a	Explain rules to be followed in writing a research paper	06	CO3
b	Explain various types of reports necessary in research industry.	06	CO 3
Q4 a	Explain 2 patents developed based on computer, in civil industry	06	CO4
b	Elaborate overall process for granting patents. How patent fees are charged	07	CO5
	OR		
b	Elaborate any one patent developed and commercialized in civil industry	0 7	CO5

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