DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD – 402103
Winter Semester Examination:– Dec.-2019

Branch:-M. Tech.in Structural Engineering **Semester: II**

Subject: -Theory of Plates and Shells (CVSE201) **Marks: 60**

Date: - 11/12/2019 **Time: 3 Hrs.**

Instructions to the Students

1. Each question carries 12 marks.
2. Attempt any five questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

Q1.a) What are the assumptions made in theory of thin plates with small deflections? Explain any one. **03**

Q1.b) Sketch the free body diagram of a plate element representing the all parameters i.e loads, moment & shear. **03**

Q1.c) Write down the expression showing Slope-Curvature relationship, Moment -Curvature relationship and resultant stresses for a plate subjected to bending. State all terms included. **06**

Q2. By using Lavy's theory get the expressions for transverse deflection w(x,y),bending & twisting for rectangular plate subjected to UDL q(x,y). **12**

Or

Find the maximum deflection in mm and bending moment in kNm for a square plate of side 3m,thickness 12cm under uniform load of 3kN/m^2 .Take E=210 GPa and μ =0.3

Q3. Find the expression for circular plate with circular hole at center subjected to bending moment M_1 & M_2 uniformly distributed along inner and outer boundaries. **12**

Q4. a) Give the classification of shells on the basis of geometry with neat sketch. **04**

b) Write down the expression showing Slope-Curvature relationship, Moment -Curvature relationship & resultant stresses. State all terms included **08**

Q5. Derive an expressions governing differential equation for a membrane shell of an arbitrary shape in Cartesian coordinates. **12**

Q6.a) Derive the 8^{th} order governing differential equation for cylindrical shell subjected to bending according to Finsterwalder theory. **10**

Q6.b) Discuss Schorer's theory briefly. **02**

Q7.Write a short notes on any three. **12**

a. Schorer's theory.

b. Differentiate between plate & shells

c. Membrane theory

d. Navier's Solution

e. D-K-J theory for cylindrical shell.

d. Expalin Kirchhoff's thin plate bending theory

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD – 402103

Winter Semester Examination: – December-2019

Branch: -M. Tech. in Structural Engineering **Semester: I**

Subject: - Theory of Elasticity & Plasticity (CVSE101) **Marks: 60**

Date: - 10/12/2019 **Time: 3 Hrs.**

Instructions to the Students

1. Each question carries 12 marks.
2. **Attempt any five questions of the following.**
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

Q.1

(a) Write down the strain tensor expression (in terms of tensorial strain) for the case of small displacement infinitesimal strain field. Also write down the expressions for the strain invariants (J1, J2 and J3). **(04)**

(b) The state of stress throughout a continuum is given with respect to the Cartesian coordinate system (x, y, z) by **(08)**

$$[\sigma]=\begin{bmatrix} 3x^2y^2 & 2x^3y^2z & 6y^2z \\ 2x^3y^2z & 12y^2z^2 & 2xyz \\ 6y^2z & 2xyz & 5x^2y^2z^2 \end{bmatrix}$$

(i) Find whether the given stress tensor satisfy equilibrium with zero body force in all directions? If not, determine the body force vector which satisfies the equilibrium.
(ii) Compute the component of stress tensor at point P (-1, 2, 1) and show these components on an elemental cube according to the standard sign conventions.

Q.2

(a) Deduce the constitutive model for the Anisotropic-Monoclinic material. **(04)**

(b) Compute the Lame's coefficients λ and μ for a material having E = 200 GPa and $\nu = 0.3$. Also find the hydro-static pressure required to create a volumetric strain of 1.15×10^{-3} (compressive) in a block of same material. **(08)**

Q.3 Derive the expression for normal, radial and shear stresses due to a circular hole in a stressed plate by Kirsch's Problem. **(12)**

Q.4 Solve any one of the following.

(a) Derive the expression for the twist (θ) of a thin walled tube when subjected to the torsion. Consider uniform thickness of the tube. (12)

(b) A 30 cm I beam (as shown in Figure 1) with flanges and with a web 1.25 cm thick, is subjected (12)

to a torque T = 50000 kg-cm (4900Nm).
(i) Find the maximum shear stress and the angle of twist per unit length.
(ii) In order to reduce the stress and angle of twist, 1.25 cm thick flat plates are welded onto the sides of the section, as shown by dotted lines. Find the maximum shear stress and angle of twist.

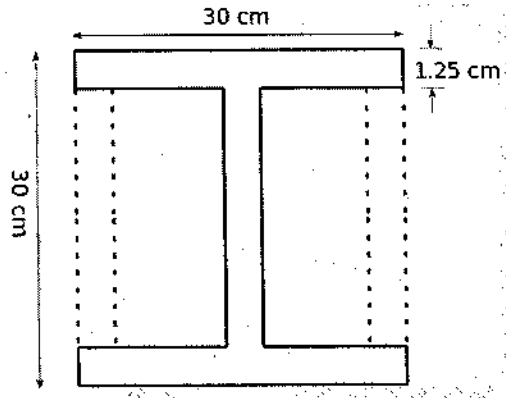

Figure 1

Q.5 Explain Prandtl-Reuss equations and Levy-Mises equations in Plastic Stress Strain relations. (12)

Q.6

(a) Explain maximum elastic strain theory (St. Venant's theory) and its limitation and application with neat and labeled figure. (06)

(b) What is the failure criteria for various failure theories for a material under uniaxial tension. Write the expressions only. (06)

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
LONERE – RAIGAD – 402 103
Winter Semester Examination – December – 2019

Branch: M. Tech. (Civil-Structure) | **Semester: I**
Subject: - Matrix Methods of Structural Analysis(CVSE 102) | **Marks: 60**
Date: - 12/12/2019 | **Time: 3 Hrs.**

Instructions to the Students

1. Each question carries 12 marks.
2. **Attempt any five questions of the following.**
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

Q. 1. **(Marks) 12**

a) Draw deflected shape of the structures shown in **figures 1 (a), 1(b), and 1(c)** shown below and explain shortly in single sentence. Indicate the possible location of points of contra-flexure. **02 x 03 = 06**

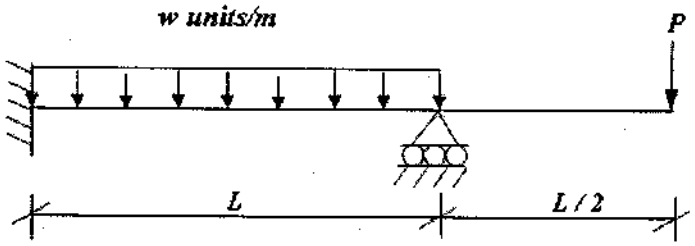

Figure 1 (a)

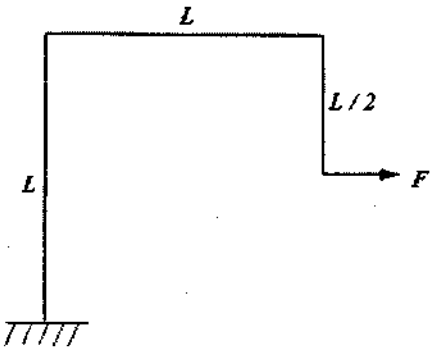

Figure 1 (b)

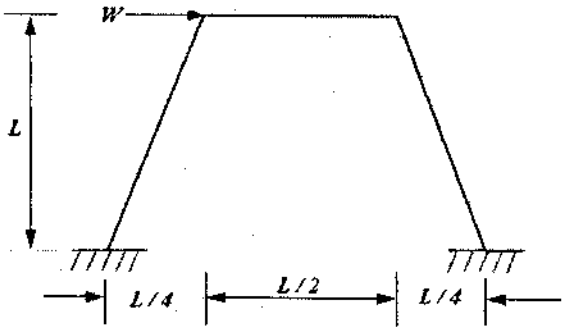

Figure 1 (c)

b) Analyse the beam as shown in the **figure 2** using **Conjugate Beam method** and hence find the maximum Slope and Deflection. Use ***E = 200 GPa, I = 4.5 x 10⁶ mm⁴***. Also, draw the deflected shape of the structure. **06**

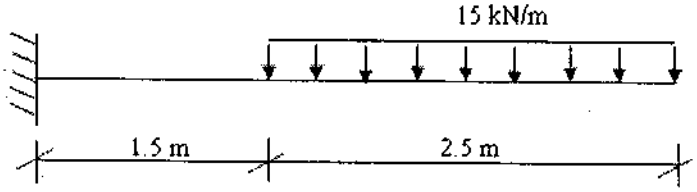

Figure 2

Q. 2. Analyse the structure as shown in **figure 3** using **Direct Flexibility method** and find the member forces in all members. *AE* is same in all the members. **12**

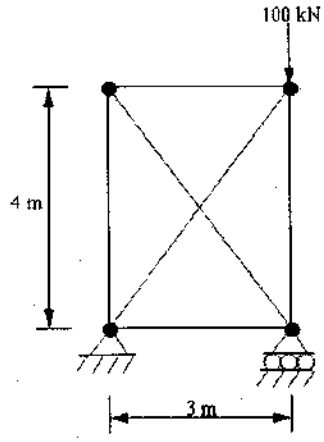

Figure 3

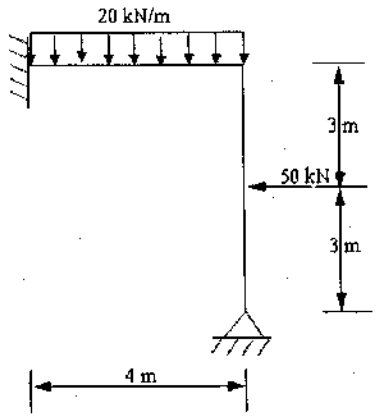

Figure 4

Q. 3. Analyse the structure as shown in **figure 4** using **Direct Stiffness method** and hence draw the SFD and BMD. **12**

Q. 4. Analyse the pin-jointed frame shown in **figure 5** using **Generalised Flexibility method** and hence find the forces in all the members. AE is same in all the members. **12**

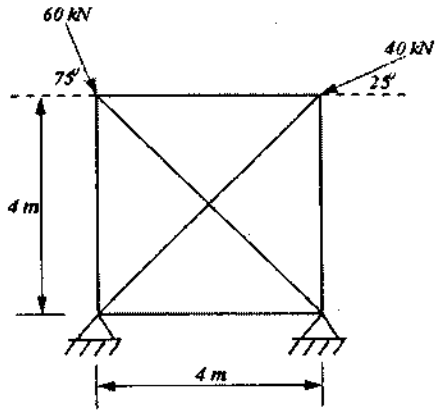

Figure 5

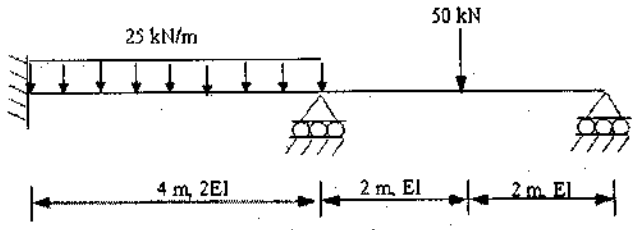

Figure 6

Q. 5. Analyse the beam as shown in **figure 6** using **Generalised Stiffness method** and hence draw the SFD and BMD.

Q. 6. **(a)** What do you understand by Non-Linear Analysis? What are different sources of Non Linearity? **04**

(b) A cantilever beam shown in figure 7 (a) has a constant section for which the M-φ (moment-curvature) relationship is given approximately by $\varphi = 5 \times 10^{-5} M(1+0.009M)$ where φ is in rad/m and M is in kNm as shown in figure 7 (b). Find the deflection at the free end. **08**

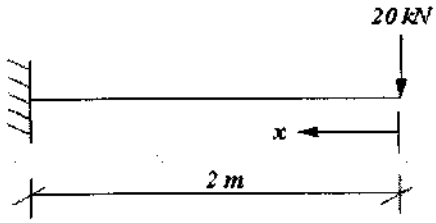

Figure 7 (a)

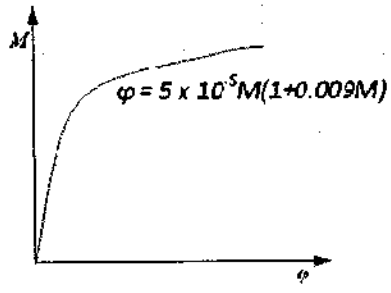

Figure 7 (b)

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
LONERE – RAIGAD – 402 103
Winter Semester Examination – December – 2019

Branch: M. Tech. (Civil-Structure) — **Semester: II**
Subject with Subject Code: - (CVSE 202) Finite Element Analysis — **Marks: 60**
Date: - 13/12/2019 — **Time: 3 Hrs.**

Instructions to the Students

1. Each question carries 12 marks.
2. **Attempt any five questions of the following.**
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and mention it

		(Marks)
Q. 1. a)	Explain merits and demerits of Finite Element Method.	**04**
b)	Explain method of point collocation under approximate methods of analysis.	**04**
c)	Explain Direct approach in FEA.	**04**
Q. 2. a)	What do you understand by transformation matrix? Obtain transformation matrix for truss element.	**04**
b)	Analyse the rigid jointed plane frame as shown in figure 1 using FEA. Assemble element equations, global equations and introduce the boundary conditions. Use $E = 210\ GPa,\ I = 5 \times 10^6\ mm^4$.	**08**

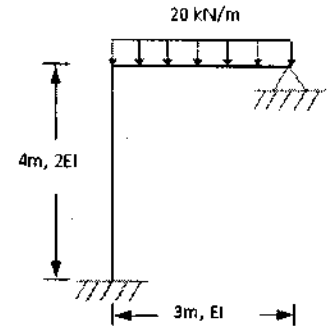

Figure 1

Q. 3.	Explain stepwise the finite element formulation of CST element for Plane stress and Plane strain analysis.	**12**
Q. 4. a)	What do you understand by static condensation? Explain static condensation procedure in details. Explain applications of the static condensation.	**06**
b)	A simply supported beam of span 12 m, depth 0.6 m and width 0.45 m is subjected to a point load of 50 kN at mid span and vertically downward pressure of 10 kN/m^2 over entire span. Draw finite element analysis model, if the beam is to be analysed under plane stress condition using ten numbers of four noded rectangular elements. Draw and show the equivalent loads at nodal points.	**06**
Q. 5. a)	Draw & explain Pascal's Triangle.	**06**
b)	Explain desirable requirements of the shape functions.	**06**
Q. 6. a)	What do you understand by iso-parametric element? Explain formulation of two dimensional iso-parametric element.	**04**
b)	What do you understand by serendipity element? Explain 8 node quadratic serendipity elements	**08**

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE- RAIGAD- 402103

Winter Semester Examination- December-2019

Branch: M. Tech Civil (Structural Engineering) **SEM :I**

Subject: Structural Dynamics (CVSE103) **Marks: 60**

Date: 17/12/2019 **Time: 3Hrs.**

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Instruction to the Students

1. Each question carries 12 marks
2. Attempt any five questions of the following
3. Illustrate your answers with neat sketches, diagram etc, whenever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

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Q.1.

a) Derive the equation of motion of vibratory system for simple harmonic method. (6)

b) What is damping and explain types of damping (6)

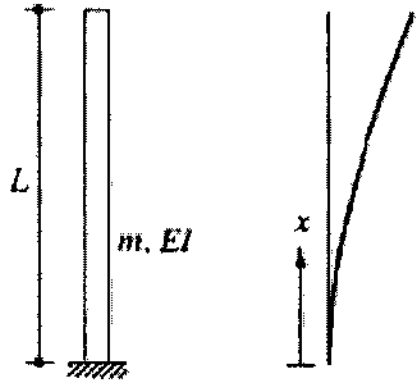
Q.2.

a) Derive the Duhamel's integral which represent the total displacement produced by the exciting force acting on the undamped oscillator. (8)

b) Explain Time steeping method for a SDOF under general loading (4)

Q.3.

a) A uniform cantilever tower of length L has mass per unit length = m and flexural rigidity EI is shown in figure 1. Assuming the shape function $\psi(x) = 1 - \cos(\pi x/2L)$, formulate the equation of motion for the system excited by ground motion and determine natural frequency. (6)



$$\psi(x) = 1 - \cos\frac{\pi x}{2L}$$

Figure 1

b) Explain natural vibration frequency by Rayleigh's method (6)

Q.4. Derive expression for mode shapes and frequencies of beam with one end fixed and other simply supported . (12)

Q.5.

a) Explain modal contribution factor (6)
b) Explain distributed mass and lumped mass system (6)

Q.6. Write short notes on any three (12)

a. Finite element method
b. Disadvantages of Rayleigh-Ritz method
c. Stodola's method
d. Degree of freedom

Paper End

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103

Winter Semester Examination – Dec - 2019

Branch: M.Tech. (Structural Engineering) **Sem.:-II**

Subject with Subject Code:-CVSE-E4A Design of Tall Buildings **Marks:60**

Date:-18/12/209 **Time:- 3 Hr.**

Instructions to the Students

1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriatelyassume it and should mention it clearly

			(Marks)
Q.1	(i)	List the various live load reduction techniques.	(4)
	(ii)	Classify the different combination of loading which is considered in design of tall buildings.	(4)
	(iii)	As per limit state design technique, when a particular structure is considered to be failed?	(4)
Q.2	(i)	Draw schematic diagrams of different bracing systems used in structures.	(4)
	(ii)	Write a short note on in-filled frame structural system.	(4)
	(iii)	Why tube systems need to be braced?	(4)
Q.3	Solve any three from the following.		
	(i)	A weight W when attached to the end of a rubber band produces in it a static elongation δ_{st} =125 mm. If the weight is raised until the tension in the band is zero and then released without initial velocity, what maximum elongation will be produced in the band due to this sudden application of load and with what frequency will the suspended weight W oscillate?	(4)
	(ii)	Explain the sources causing twisting of structure.	(4)
	(iii)	State the sources of differential movement in structural members.	(4)
	(iv)	Draw schematic curves of (a) Creep strain vs Time; (b) Creep coefficient vs Age at loading; (c) Creep coefficient vs Construction time	(4)

Q.4 (i) Draw schematic diagram showing major componants of chimney. (4)

(ii) A reinforced concrete chimney 50 m high above ground has an outside diameter of 4 m. The thickness of the shell is 20 cm at top and it is increased to 25 cm and 30 cm at 18 m and 30 m from top. Vertical steel bars = 1% of cross sectional area throughout. The total wind load above the section at 18 m from top may be taken as 93 kN. Find the stresses developed due to wind and dead loads at the section 18 m from top of the chimney. Assume modular ratio m=13. (4)

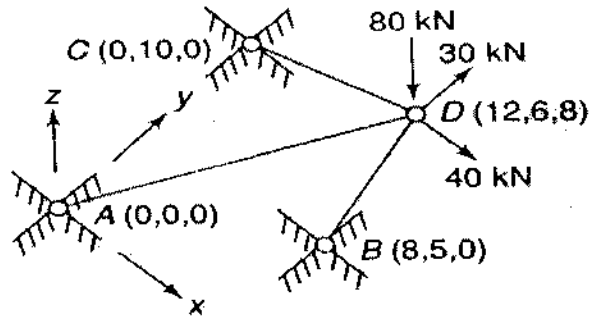
(iii) State the purpose of providing cap and platforms in chimney structure. (4)

Q.5 (i) Draw schematic diagram of cooling tower and explain its working principle. (6)

(ii) Draw (a) Wind pressure distribution; (b) Meridonial thrust diagram of cooling tower when it is subjected to dynamic wind pressure. (6)

Q.6 (i) Three spans of 150 m, 400 m and 350 m as separate deadend spans isolated from each other. Calculate the sag and the slack if the tension in the cable H at 158 °C is 18.40 kN and w = 14.72 N/m. (6)

(ii) Using the tension-coefficient method, calculate the forces in the members of the pin-jointed space frame shown in figure. The numbers in parentheses are the Cartesian coordinates of the joints of the frame. (6)



DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
LONERE - RAIGAD - 402 103
Winter End Semester Examination - Dec - 2019

Branch: M.Tech. (Structural Engineering) **Semester: II**
Subject with Subject Code:- Retrofitting of Structures CVSE-E3C **Marks: 60**
Date:- 18/12/2019 **Time: 3 Hrs.**

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Instructions to the Students

1. Each question carries 12 marks.
2. Attempt any five questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

(Marks-60)

Q.1. a) Distinguish between quality management system and quality control? (06)
b)What are the causes of distress and deterioration of concrete? (06)

Q.2.a) Write a note on rebound hammer test? (03)
b) What are the statistical parameters of cube strength? Explain (03)
c) Describe the various remedial measures and their relative efficiency against corrosion of steel in RC structures? (06)

Q.3.a) What repair materials are used in highly corrosive environment? (06)
b) What are the various types of masonry wall constructions? (06)

.4.a) Define grouting? Give a short note on epoxy coatings? (06)
b) Discuss about the environment effects which leads to deterioration of concrete structure. (06)

Q.5.a) Explain polymer modified concrete with their general guidelines and precautions for use? (06)
b) What is sulphur infiltrated concrete? What are the applications of sulphur infiltrated concrete? (06)

Q.6. a) What is meant by jacketing? Describe different types of jacketing? (06)
b) What are the advantages of using latex modified systems? (06)

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,

LONERE – RAIGAD – 402 103

Winter Semester Examination – Dec – 2019

Branch: M. Tech. (CIVIL) **Semester: I**

Subject: - ELE-I (Numerical Methods) (CVSE-E1B) **Marks: 60**

Date: - 19/12/2019 **Time : 3 Hrs.**

Instructions to the Students

1. Each question carries 12 marks.
2. Attempt any five questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

(Marks)

Q.1. **1) What are the different types of errors in representing numbers.** **06**

2) Write short note on

a) Inverse error analysis

b) Mantissa and Exponent **06**

Q.2. **1) Apply Gauss –Jorden method to find the solution of the following system:**

$10x + y + z = 12$; $2x + 10y + z = 13$; $x + y + 5z = 7$. **08**

2) Solve:

a) Solve for a positive root of $x - \cos x = 0$ by Regula Falsi method. **04**

Q.3. **1) It is known that the curve $y = ax^b$ fits in data given below. Find the best values of a and b.** **06**

X :	1	2	3	4	5	6
Y :	1200	900	600	200	110	50

2) Derive the Lagranges interpolation formula. Using Lagranges formula , find y(10) from the following table :

X :	5	6	9	11
Y :	12	13	14	16

06

Q.4. **1) Evaluate**

a) The integral $\int_0^1 (x\text{^}2/1 + x\text{^}3)dx$ using Simpsons 1/3rd rule and trapezoidal rule. **06**

2) Using Rombergs method evaluate the integral $\int_0^{0.5} (x/\sin x)\ dx$ correct to three decimal places. **06**

Q.5. **1) Using Runge – Kutta method of fourth order, solve $dy/dx = y^2 - x^2/y^2 + x^2$ with $y(0) = 1$ at $x = 0.2, 0.4$** **06**

2) Write a short note on

a) Solve dy/dx = x+ y , y(0) = 1 by Taylor series method. Hence find the values of y at x = 0.1 and x = 0.2. 06

Q. 6. 1) Using the finite difference method , find y (0.25), y(0.5), y (0.75) satisfying the differential equation y"+ y = x, subject to the boundary conditions y (0) = 0, and y (1) = 1. 06

2) Find the dominant eigen value and the corresponding eigen vector of 06

$$A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

Paper End

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103

Winter Semester Examination – Winter- 2019

Branch: Structural Engineering (M.Tech) **Sem.:- II**
Subject:- Research Methodology (CVSE-E5A) **Marks: 60**
Date:- 20/12/2019 **Time:- 3 Hrs.**

Instructions to the Students

1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

(Marks)

Q.1. What do you mean by research? Describe the research process along with flowchart. 12

Q.2. 12

a. Define the measures of Central tendency and dispersion

b. What do you understand by Coefficient of Correlation? Enlist eight properties of coefficient of Correlation.

Q.3. 12

a. Distinguish between sampling and non sampling errors

b. Write in brief about following

i) Importance of Chi-Square test in engineering

ii) Significance of analysis of variance

Q.4. Describe in brief the importance of editing, coding, classification, tabulation and presentation of data in the context of a research study. 12

Q.5. 12

a. What are different types of research reports? Discuss the format of good research report?

b. Write a note on: Data Analysis using software.

Q.6. Explain various methods of factor analysis in detail 12

----------Paper End----------

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Winter Semester Examination – December 2019

Course: M. Tech. (Structural Engineering) **Sem: I**

Subject Name: Advanced Pre-stressed concrete **Subject Code:CVSE-E2/01**

Max Marks: 60 **Date:-21/12/2019, Duration:- 3 Hr.**

Instructions to the Students:

1. Attempt any **five** questions of the following .
2. Figures to **right** indicate full marks.
3. Assume **suitable** data if necessary.
4. Use of **IS:1343 and IS:3370 and IS:784 Codes** are permitted .

Q. 1 A) Compare between RCC and Pre-stressed concrete. **(06)**

B) Prepare a short note on pre-stressing system, by drawing suitable sketches. **(06)**

Q.2 A) A pre- stressed concrete beam 250x600mm deep is subjected to an axial pre stressing force of 1500KN ,Design end block for the beam. Use any suitable method . **(08)**

B) Explain importance of end block . **(04)**

Q.3 A)What steps are followed in design of continuous pre-stressed concrete beam ? **(04)**

B)A pre stressed concrete tank of dia. 20m has to resist an internal pressure head of 5m of water.Find the reinforcement per meter height and thickness of concrete required. Ignore strength of mortar coating (08)

Q.4 Mid section of composite beam consist of cast –in-situ flange 325x50mm over 100x250mm pre-cast pre-tensioned unit .Stress distribution for pre-cast unit is triangular with zero stress at top and 12.5 N/mm^2 at bottom. Find the u.d.l for composite beam on a simply supported span of 6m with the condition ,the flange is supported independently while it is cast. **(12)**

Q.5 A)How will you find the defects in pre-stressed concrete structures and explain the remedies for the same with suitable examples. **(08)**

B)What care shall be taken to avoid corrosion in the pre-stressing cables? **(04)**

Q.6 Write short notes on any three (12)

a) Is code provisions for design of composite section

b) Kern distance and efficiency of section.

c) Concordant cables .

d) Shear in pre stressed in concrete.

*** End ***