CENTRAL UNIVERSITY OF HARYANA

End Semester Examinations march2023

Programme: M.Tech (Energy System and Management)   **Session: 2022-23**

Semester: First   **Max. Time: 3 Hours**

Course Title: Introduction to Renewable Energy Systems   **Max. Marks: 70**

Course Code: MTESM-102

Instructions:

1. Question no. 1 has seven parts and students need to answer any four. Each part carries 3.5Marks.

2. Question no. 2 to 5 have three parts and students need to answer any two parts of each question. Each part carries six marks.

Q 1. (4X3.5 =14)

    (a) What is ocean thermal energy?

    (b) What is the current Global power ranking of India in renewable sector?

    (c) Which materials are used in manufacturing of PV cell?

    (d) Which type of generators is used in WECS?

    (e) Difference between mini and micro-hydroelectric plant. .

    (f) Which point is considered for selection of site in bio-gas plant?

    (g) What is the need of supper capacitor?

Q 2. (2X7=14)

    a) Difference between conventional and non- conventional energy sources. Explain advantage and disadvantage also.

    b) What are the prospects of renewable energy sources in India?

    c) Explain the various schemes for promotion of renewable energy utilization implemented by Indian Ministry of New and Renewable Energy (MNRE).

Q3. (2X7=14)

    a) Explain Wind Energy Conversion System (WECS). What are the basic components?

    b) Explain characteristics of solar PV cell.

    c) What is the origin of biomass energy? What is the present status of development of biomass energy resource in India?

Q 4. (2X7=14)

    a) Write short note on geo-thermal power plants.

    b) Explain double basis arrangement in Tidal power plant.

    c) Explain advantages and disadvantages of geothermal energy over other forms of energy sources.

Q 5.   (2X7=14)

  a) Explain the working principle of super capacitors and its application.

  b) What is the difference between a battery and a super capacitor?

  c) What factors that decide the VRLA battery to completely charged from fully
     discharged condition?

CENTRAL UNIVERSITY OF HARYANA

First Semester Term End Examinations March 2023

Programme: M.Tech   Session: 2022-23

Semester: First   Max. Time:3 Hrs

Course Title: DIGITAL SIGNAL PROCESSING   Max. Marks: 70

Course Code: MTESM-108

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and student are required to answer any two parts of in each question. Each part carries seven marks.

Q 1.   (4X3.5=14)

   a) Find the requirement of stability of a discrete-time system in terms of unit impulse response.
   b) Explain the linearity and time-invariance property of a discrete-time system.
   c) Give an example of a 2nd order constant co-efficient linear difference equation.
   d) What do you mean by frequency sampling?
   e) What do you mean by Interpolation?
   f) What is Chirp Z- Transform.?
   g) Find the Z-transform and ROC of unit step signal.

Q 2.   (2X7=14)

   a) A discrete-time system is characterized by the following difference equation,

   $$y[n] = 3x^2(n) - 2x(n-1).x(n+1);$$

   where x(n) and y(n) denote the output and input of the discrete-time system, check the system for linearity and time-invariance.

   a) What do you mean by sampling, quantization and zero-order hold (ZOH)? Find expression for quantization error and transfer function of ZOH.

   c) Find the convolution of the following two sequences:

   $x(n) = \delta (n - 2) - 3\delta (n - 4) + 2\delta (n - 6)$ and $h(n) = 5\delta (n + 3) + \delta (n) + 2 \delta (n - 2) + \delta (n-3)$

Q3.   (2X7=14)

   a) Find the solution of the linear constant coefficient difference equation using Z-transform:
       $y(n) = 0.25y(n-2) + x(n)$; Assuming that $x(n) = \delta(n - 1)$ with $y(-1) = y(-2) = 1$
   b) Explain 8-pont Radix-2 decimation in time FFT algorithm with butterfly diagram.
   c) Compute the N -point circular convolution of $x_1(n)$ and $x_2(n)$ using DFT, where
       $x_1(n) = x_2(n) = 1$ for n= 0 to N-1 and 0 elsewhere.

Q 4.   (2X7=14)

   a) Design an FIR linear phase low-pass filter using Hamming window according to the following specifications:
       $\Omega_p=0.19\pi$, $\Omega_s=0.21\pi$ and $\delta_p = \delta_s =0.1$
   b) Design a low-pass Butterworth filter to meet the following specifications:
       $f_p = 6kHz$, $f_s = 10kHz$ and $\delta_p = \delta_s =0.1$
       You can use Table 1.
   c) Explain the bilinear transformation method for design of IIR filter from the analog filter.

Q 5.   (2X7=14)
   a) Explain least mean square (LMS) adaptive filter algorithm for noise cancellation.
   b) Explain the decimation process to change the sampling frequency with respect to multi-rate signal processing.
   c) Differentiate between voiced and unvoiced speech segments. Explain the selection of voiced segments on the basis of short-time energy and zero-crossing rate.

Table: 1

Butterworth Coefficients a_k to Four Decimal Places

n	a_0	a_1	a_2	a_3	a_4	a_5	a_6	a_7	a_8	a_9	a_{10}
1	1	1									
2	1	1.4142	1								
3	1	2	2	1							
4	1	2.6131	3.4142	2.6131	1						
5	1	3.2361	5.2361	5.2361	3.2361	1					
6	1	3.8637	7.4641	9.1416	7.4641	3.8637	1				
7	1	4.4940	10.0978	14.5918	14.5918	10.0978	4.4940	1			
8	1	5.1258	13.1371	21.8462	25.6884	21.8462	13.1371	5.1258	1		
9	1	5.7588	16.5817	31.1634	41.9864	41.9864	31.1634	16.5817	5.7588	1	
10	1	6.3925	20.4317	42.8021	64.8824	74.2334	64.8824	42.8021	20.4317	6.3925	1

CENTRAL UNIVERSITY OF HARYANA

<u>Term End Examinations March 2023</u>

Programme: M.Tech.   Session: 2022-23

Semester: First   Max. Time: 3 Hours

Course Title: Energy Storage Systems for Electric Vehicles   Max. Marks: 70

Course Code: MTESM-108

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and students are required to answer any two parts of each question. Each part carries seven marks.

Q 1.   (4X3.5=14)

    a)   What is meant by Electric Vehicles?

    b)   Mention the advantages and disadvantages of Electric Vehicles?

    c)   What is meant by Hybrid Electric Vehicles?

    d)   What is meant by fuel cell?

    e)   Discuss the functioning of Lithium-ion battery?

    f)   Explain unidirectional and Bidirectional charging in Electric Vehicles?

    g)   Explain in details about the regenerative braking?

Q 2.   (2X7=14)

    a)   Explain general background of alternative energy sources and sustainability?

    b)   Explain in brief about Plug-in-Hybrid Electric Vehicles?

    c)   Discuss in details about the operating mode of series and parallel hybrid Electric Vehicles?

Q3.   (2X7=14)

    a)   Explain in brief about the Dynamic equation of Electric Vehicles?

    b)   Discuss in details about the energy and power requirement for various Hybrid Eclectic Vehicles (HEVs)?

    c)   Discuss in details about the specification and requirements of batteries for Electric Vehicles?

Q 4.   (2X7=14)

    a)   Discuss in details about the working principle of Supercapacitors with neat diagram?

    b)   Explain in brief about the working principle of fuel cell and hydrogen storage?

    c)   Differentiate between supercapacitors, fuel cell and hydrogen storage?

Q 5.   (2X7=14)

    a)   Explain battery thermal management system?

    b)   Discuss in detail about the tractive effort, transmission requirement and vehicle performance in Electric vehicles?

    c)   Explain regulations and safety aspects of High voltage batteries?

CENTRAL UNIVERSITY OF HARYANA

<u>Term End Examinations May 2023</u>

Programme: M.Tech. (Energy System Management)	**Session: 2022-23**
Semester: Second	**Max. Time: 3 Hours**
Course Title: Smart Grid	**Max. Marks: 70**
Course Code: MTESM- 205	

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and students are required to answer any two parts of each question. Each part carries seven marks.

Q 1.   (4X3.5=14)

- a) Differentiate between Smart grid and conventional grid?
- b) List the opportunities related to smart grid?
- c) Describe the smart Substation?
- d) Explain phasor measurement unit?
- e) Analyze the power quality management in smart grid?
- f) Explain the EMC in smart grid?
- g) What is HAN?

Q 2.   (2X7=14)

- a) What are the present development and international policies in smart grid?
- b) Explain how the reliability of smart grid can be enhanced by integrating intelligent electronic devices (IED) into it?
- c) Describe an integration of smart appliances into grid for Home and building automation?

Q3.   (2X7=14)

- a) Compare conventional metering and smart metering?
- b) Differentiate between HAN, NAN, WAN?
- c) What is geographic information system (GIS)? Explain the components of GIS?

Q 4.   (2X7=14)

- a) Describe the power quality issues of Grid connected renewable energy system?
- b) Write a note on protection and control of microgrid?
- c) Explain the issues about power quality monitoring and power quality measurement in smart grid.?

Q 5.   (2X7=14)

- a) What is the difference between microgrid, macro grid, and nano grid?
- b) Formulate a demand side integration algorithm for a hybrid renewable energy system and energy management system?
- c) What is broadband over power line? Explain its working and features?

Course Code: MTCE 112   **Max Time: 3 hrs.**
Course Title: Design of Prestressed Concrete Structures   **Max Marks: 70**

Instructions:
1. Question number **one (PART-I)** is compulsory and carries 14 marks in total (Each PART carries 3.5 Marks).
2. Question numbers 2(two) to 5(five) carry 14 marks each with internal choice.
3. Use of IS CODE 1343:1980 is allowed.

PART -I

Q1 Write a short note on following –   **(3.5×4=14 marks)**
a. What is the necessity of using high strength concrete in P.S.C. work?
b. List the various differences between the losses of prestress in pre-tensioned and post- tensioned PSC beams.
c. Explain the terms with reference of pretensioned pre-stress concrete structure – (i) transmission length (ii) development length.
d. Write the various advantages of composite construction in PSC.

PART –II

Q2(a) Differenciate between thrust line concept and load balancing concept of analysis of prestressed concrete structures.   **(04 marks)**

(b) A prestressed concrete T-beam is to be designed to support a superimposed load of 4.4 kN/m over a span of 5 m. The 'T' beam is made up of a flange 400 mm 40mm thick. The rib is 100 mm wide and 200 mm deep. The stress in concrete must not exceed 15 N/mm^2 at the bottom fiber and zero at the top fiber, due to self -weight and prestressing force. Evaluate the prestressing force and its eccentricity. Assume the density of concrete is 24 kN/m^3 and the loss of prestress at 20%.
                                                  (10 marks)

or

Q2 (a) Define the terms-(i) tendon (b) full prestressing (c) partial prestressing (d) anchorage
                                               (04 Marks)

(b) A prestressed concrete sleeper produced by pre-tensioning method has a rectangular cross-section of 300mm × 250 mm (b × h). It is prestressed with 9 numbers of straight 7mm diameter wires at 0.8 times the ultimate strength of 1570 N/mm^2 as shown in fig. below. Estimate the percentage loss of stress due to elastic shortening of concrete. Consider m = 6
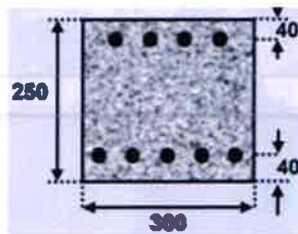
                                                 (10 marks)

or

Q3 (a) What are the different types of failure observed in a prestressed concrete beam? Explain with neat sketches.   **(04 Marks)**

(b) A post tensioned bridge girder with unbounded tendons is of base section of overall dimensions 1200 mm wide by 1800 mm deep with wall thickness of 150 mm. The high tensile steel has an area of 4000 mm^2 and is located at an effective depth of 1600 mm. The effective prestress in

steel after losses is 1000 N/mm^2, and the effective span of the girder is 24m. If f_{ck} = 40N/mm2 and f_p = 1600 N/mm^2. Estimate the ultimate flexural strength of the section. **(10 Marks)**

or

Q3 (a) Discuss briefly the modes of failure due to shear **(4 Marks)**

(b) If the support section of a PSC beam 100 mm wide and 250 mm deep is required to support an ultimate shear force of 80 KN. The compressive prestress at the centroidal axis is 5 N/mm^2. The characteristic cube strength of concrete is 40 N/mm^2. The cover to the tension reinforcement is 50 mm. If the characteristic tensile strength of stirrups is 415 N/mm^2, design suitable shear reinforcements in the section using IS code recommendations. **(10 marks)**

Q4 (a) Why PSC members will have relatively lesser deflection compared to RCC member under working loads? **(02 Marks)**

(b) A rectangular concrete beam of cross-section 150mm x300mmdeep is simply supported over a span of 8 m and is prestressed by means of a symmetric parabolic cable at a distance of 75 mm from the bottom of the beam at mid span and 125 mm from the of the beam at support section. If the force in the cable is 350 kN and the modulus of elasticity of concrete is 38 kN/mm^2, calculate-(i) The deflection at mid span when the beam is supported its own weight and (ii) the concentrated load which must be applied at midspan to restore it to the level of supports. **(12 marks)**

or

Q4 (a) Write a short note on development length in pre tensioned members. **(04 Marks)**

(b) A high tensile cable comprising 12 strands of 15 mm diameter with an effective force of 2500 kN is anchored concentrically in an end block of a post-tensioned beam. The end block is 400 mm wide and 800 mm deep and the anchor plate is 200 mm wide by 260 mm deep. Design suitable anchorage zone reinforcements using Fe415 grade HYSD bars using IS:1343 code provisions. **(10 Marks)**

Q5 (a) Briefly outline the method of estimating the deflection of composite construction in case of (i) Unpropped and (ii)propped during the casting of the slab. **(04 Marks)**

(b) A rectangular Pretensioned concrete beam has a breadth of 100mm and depth of 230mm and the prestress after all losses have occurred is 12 N/mm^2 at the soffit and zero at the top flange of breadth of 300 mm and depth 50mm.Calculate the maximum uniformly distributed live load that can be supported on a simply supported span of 4.5m, without any tensile stresses occurring if – (i) the slab is externally supported while casted, (ii) the prestressed beam supports the weight of the slab while casting. **(10 Marks)**

or

Q5 (a) What are the various assumptions used for analysis of composite construction in PSC. **(04 Marks)**

(b) A precast pretensioned beam of rectangular section has a breadth of 100 mm and a depth of 200 mm. The beam with an effective span of 5m, is prestressed by tendons with their centroids coinciding with the bottom Kern. The initial force in the tendons is 150 kN. The loss of pre-stress may be assured to be 15 %. The beam is incorporated in a composite T- beam by casting a flange of breadth 400 mm and thickness 40 mm. If the composite beam supports a live load of 8 kN/m^2, Calculate the resultant stress developed in the Precast beam and in situ cast slab concrete assuming the pretensioned beam as a Unpropped if the modulus of elasticity of concrete in slab and beam are different. Take E_c (Prestressed beam) =35kN/mm^2. **(10 Marks)**

Course Code: MTCE 112   **Max Time: 3 hrs.**
Course Title: Design of Prestressed Concrete Structures   **Max Marks: 70**

Instructions:
1. Question Number one (PART-I) is compulsory and carries total 14 marks (Each sub-Question carries two Marks).
2. Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice. If any question has 3 subparts worth 7 marks each, you can attempt any two-part from the three provided, earning 14 marks in total.
3. Use of **IS CODE 1343:1980** is allowed.

PART -I

Q1 Write a short note on following –   **(2×7=14 marks)**
   a. What is the necessity of using high strength concrete in P.S.C. work?
   b. List the various differences between the losses of prestress in pre-tensioned and post-tensioned   PSC beams.
   c. Explain the terms with reference of pretensioned pre-stress concrete structure – (i) transmission length (ii) development length.
   d. Write a note on transmission length in pre tensioned members.
   e. Why PSC members will have relatively lesser deflection compared to RCC member under working loads?
   f. Explain the terms (a) End block (b)anchorage zone (c) bursting tension.
   g. What are the various assumptions used for analysis of composite construction in PSC?

PART –II

Q2 (a) Briefly explain different types of coordinate systems with neat sketches in matrix analysis   **(07 marks)**

(b) A concrete beam of symmetrical I section of simply supported span 10 m has a width and thickness of flange 250 mm and 80 mm respectively. The overall depth is 500 mm. The thickness of web is 80 mm. The beam is prestressed by a parabolic cable with an eccentricity of 150 mm below centroidal axis at midspan and concentric at supports. The effective prestress in the cable is 200 kN. The beam supports a live load of 3 kN/m. Compute the fiber stress at midspan under working load.   **(07 marks)**

(c) A PSC beam 200 mm x 300 mm is prestressed with wires of area 300 mm^2 located at an eccentricity of 100 mm below centroidal axis at midspan and zero eccentricity at supports, carries an initial stress of 1000 N/mm2. The span of the beam is 10 m. Calculate the percentage loss of stress in wires if, (i) the beam is pre tensioned (ii) the beam is post tensioned using following data: Es = 210 kN/mm^2; Ec = 35 kN/mm^2, Relaxation of stress in steel = 5% of initial stress, shrinkage strain in concrete for pretensioning = 300×10^{-6}, Age of concrete at transfer for post tensioned beam = 8 days, Creep coefficient = 1.6, Slip at anchorage = 2 mm, Coefficient of friction between concrete and cable = 0.55, Friction coefficient for wave effect = 0.0015/m.   **(07 marks)**

Q3 Design a post-tensioned roof girder beam as a class 1 structure to suit the following data: Effective span = 30 m, Live load = 9 kN/m, Dead load (excluding self-weight) = 2 kN/m, Load factors-For dead load = 1.4, For live load = 1.6, Cube strength of concrete, f_{cu} = 50 N/mm^2, Cube strength at transfer. F_{ci} = 35 N/mm^2, Tensile strength of concrete, f_t = 1.7 N/mm^2, Modulus of elasticity of concrete, E_c = 34 kN/mm^2, Loss ratio, n = 0.85. 8 mm diameter high

tensile wires having a characteristic tensile strength f_{pu} = 1500 N/mm^2 are available for use. The modulus of elasticity of high tensile wires is 200 kN/ mm^2. **(14 marks)**

or

Q3 A prestressed T section has a flange width of 600 mm and the thickness of the flange is 230 mm. Thickness of rib is 150 mm. Total depth of beam is 1300 mm. fck = 45 MPa and characteristics strength of tendon is 1500 MPa. Effective stress in tendons after all losses = 900 MPa. Area of steel = 2300 mm2. At a particular section beam is subjected to an ultimate moment of 2130 kN-m and shear force of 237 kn Effective prestress at extreme tensile face of beam (fpt) = 19.3 MPa. Calculate the ultimate shear resistance of beam at that section.

(14 marks)

Q4 A post tensioned beam (bonded) 300mm x 600mm has a prestress of 1560 kN in tendons immediately after prestressing which eventually reduces to 1330 kN due to losses. The beam is simply supported over a span of 12 m and carries concentrated loads of 44.5 kN each at a distance of 4.5 m from supports. The tendon is parabolic with zero eccentricity at support and 120 mm below centroidal axis at midspan. Take E_c = 35 kN/mm^2. Calculate deflection at midspan due to-(i) Prestress + self-weight. (ii) Prestress + self-weight + live load. **(14 marks)**

or

Q4 The end block of a post tensioned beam is 450mm x 550mm. Four cables, each made up of 8 wires of 12 mm diameter strands and carrying a force of 1150 KN are anchored by plate anchorages, 150mm x 150mm, located with their centres at 125 mm from the edges of the end block. The cable duct is of 50 mm diameter. The cube strength of concrete at transfer is 25 N/mm^2. Check for bearing stress as per IS 1343 provisions. Design suitable anchorage for the end block. **(14 Marks)**

Q5 (a) What are the various advantages of composite construction in PSC? **(07 Marks)**

(b) A precast pretensioned beam of rectangular section has a breadth of 100 mm and a depth of 200 mm. The beam with an effective span of 5m is prestressed by tendons with their centroids coinciding with the bottom Kern. The initial force in the tendons is 150 KN. The loss of pre-stress may be assured to be 15 %. The beam is incorporated in a composite T- beam by casting a flange of breadth 400 mm and thickness 40 mm. If the composite beam supports a live load of 8 KN/m^2, Calculate the resultant stress developed in the Precast and in situ cast concrete assuming the pretensioned beam as propped during the casting of the slab. Assume the same modules of elasticity for concrete in precast beam and in situ cast slab. **(07 Marks)**

(c) A rectangular Pretensioned concrete beam has a breadth of 100mm and depth of 230mm and the prestress after all losses have occurred is 12 N/mm^2 at the soffit and zero at the top flange of breadth of 300 mm and depth 50mm.Calculate the maximum uniformly distributed live load that can be supported on a simply supported span of 4.5m, without any tensile stresses occurring if (i) the slab is externally supported while casted, (ii) the prestressed beam supports the weight of the slab while casting. **(07 Marks)**

Course Code: MTCE 114   Max Time: 3 hrs.
Course Title: Cement Composite Materials   Max Marks: 70

Instructions:

1. Question Number **one (PART-I)** is compulsory and carries 14 marks in total (Each PART carries 3.5 Marks). Attempt any 4 questions out of 7.

2. Question Numbers **2(two) to 5(five)** carry 14 marks each with internal choice. Attempt any 2 sub-parts **(from Q2 to Q5)** of your choice, which carries 7 marks each.

PART -I

Q1 Write a short note on following –   (3.5×4=14 marks)

   (a). What are the applications of fiber reinforced concrete?

   (b). What do you mean by aspect ratio?

   (c). What do you mean by composite material? Explain in brief.

   (d). What is Mix design? How it is different from the nominal mix design?

   (e). What is polymer modified concrete?

   (f). How silica-fume is added into conventional concrete? Explain IS standards for silica fume concrete.

   (g). What is high performance concrete ? Explain in brief.

PART –II

Q2 (a) What is Fiber Reinforced Concrete? Explain different Types of Fiber Reinforced Concrete.   **(07 marks)**

   (b) Enlist the different types of fibers used in Fiber Reinforced Concrete and also write their significance.   **(07 marks)**

   (c) Does size and shape of fibers have any role in determining their suitability? How these factors affect the properties of fiber reinforced concrete?   **(07 marks)**

Q3 (a) Classify different types of Indian Fly ashes and also explain the Properties of Fly ash in detail.   **(07 marks)**

   (b) What are the effects of Fly Ash on Development of Concrete Strength?   **(07 marks)**

(c) What are the technical problems of conventional concrete that can be solved with fiber-reinforced concrete? **(07 marks)**

Q4 (a) Explain in details – **(07 marks)**

    (i) Polymer impregnated concrete   (ii) Polymer modified concrete

(b) What do you mean by ferrocement and also explain method of its construction.

(07 marks)

(c) define silica-fume concrete. Write down the applications of silica fume concrete.

(07 marks)

Q5 (a) Explain with neat sketches – (i)Aerated cement mortars   **(07 marks)**

                (ii) No fines concrete

(b) What are the various applications of light weight concrete? Explain in detail.

(07 marks)

(c) Write down the design standards required for the light weight concrete. **(07 marks)**

Programme: M.Tech. in Structural Engineering   **Session: 2022-23**

Semester: First   **Max. Time: 3 Hours**

Course Title: Condition Assessment & Retrofitting of Structures   **Max. Marks: 70**

Course Code: MTCE 103

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 4 have three parts and student are required to answer any two parts of each question. Each part carries seven marks.

3. Question no. 5 has two parts and student are required to answer any one part of question. Each part carries fourteen marks.

Q 1.   (4X3.5=14)

     a)   Define embedded metal corrosion in concrete.

     b)   Define holistic model of concrete deterioration

     c)   Define FRP wrapping.

     d)   What do you mean by substrate bonding agents?

     e)   Define preplaced aggregates concrete method of surface repair.

     f)   Define Seismic Vulnerability.

     g)   Differentiate between repair and retrofitting.

Q 2.   (2X7=14)

     a)   What is significance of using UPV test in concrete? Define various types of transmissions in UPV testing with the help of diagram

     b)   Enlist various methods for evaluating the strength of in-situ concrete in an existing concrete structure. How the diameter of core would influence the interpretation of core results?

     c)   Fifty five mm diameter cores were extracted from an existing concrete structure having concrete with aggregate of 40 mm size. Will you accept the cores for evaluating in-situ compressive strength of concrete? Discuss

Q3.   (2X7=14)

     a)   What are the characteristics of a good substrate? How will you plan for strategy and design of a surface preparation in the deteriorated reinforced concrete structural member.

     b)   Explain repair, maintenance and rehabilitation in the structures. Differentiate between active and passive strengthening techniques with the help of diagram

     c)   Describe, with the help of neat sketches, restoration and strengthening of RC beams.

Q 4.   (2X7=14)

   a) State the reasons for the poor performance of masonry buildings in seismic areas.

   b) Explain various type of Plan Irregularities and Vertical Irregularities in Irregular RCC
      Buildings with the help of diagrams

   c) Explain in detail various methods of column strengthening with the help of diagrams

Q 5.   (2X7=14)

   a) A four storey building (shown in figure below) has been analyzed using response
      spectra method. Consider the following data:
         Location of building – Delhi
         Type of building –residential (OMRF)
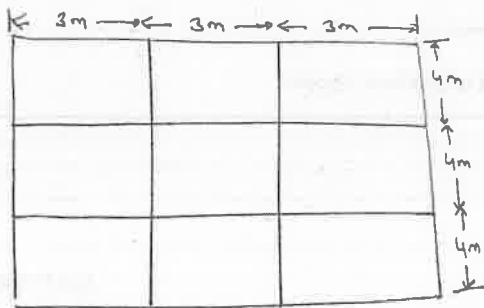   Ht. of storey- 3 m
         Size of column- 400x400 mm
         Size of beam – 200x400mm
         Slab thickness – 130 mm
         Imposed load- 3kN/m2
         Roof load-1.5 kN/m2

      Calculate the base shear and floor loads for bare frame RC building. Assume suitable
      data.

   b) What are the possible damages to RC buildings in earthquake-prone regions? What
      are the principles of earthquake-resistant design of RC buildings in accordance to
      relevant Indian Standard? Explain in detail the lessons learnt goals of earthquake
      resistant design

Programme: M.Tech (Structural Engineering)
Semester: First Semester
Course Title: Advanced Reinforced Concrete Design
Course Code: MTCE 102

Session: 2022-23
Max. Time: 3 Hours
Max. Marks: 70

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and students are required to answer any two parts of each question. Each part carries seven marks.

Note: IS 456:2000 is allowed to use in the exam.

Q 1.   (4X3.5=14)

   a) What is a column? Give the classification of columns.
   b) What are additional secondary moments in slender columns? How do we include them in the design of braced and unbraced slender columns?
   c) Write down the codal provision for providing reinforcement in a deep beam.
   d) Explain the yield line theory of slabs. What are the properties of yield lines?
   e) What are the methods available for yield line analysis of slabs?
   f) What do you understand by the term limit state of Serviceability? Explain the terms "short term" and "long term" deflection of beam.
   g) Explain the difference between bunker and silos using diagram.

Q 2.   (2X7=14)

   a) A reinforced concrete short column is 400 mm × 400 mm and has 4 bars of 20 mm dia. Determine the ultimate load carrying capacity of column if M20 concrete and Fe 415 steel is used. Assume e_{min}<0.05D.
   b) Design the reinforcement for a circular column of diameter 500 mm subjected to an ultimate load of 1600 kN and an ultimate moment of 125 kNm about the major axis. Use M20 concrete and Fe 415 steel.
   c) Classify various types of reinforced concrete shear walls. Explain in brief with diagram
     i) Coupled Shear wall   ii) Rigid Frames Shear walls

Q3.   (2X7=14)

   a) Write down the codal provisions for the design of Deep beams.
   b) A simple supported deep beam is 300 mm wide, 4200 mm deep, has a clear span of 6 metre. The beam carries a superimposed load of 300 kN/m. The beam has a bearing of 450 mm at each end. Design the beam with M20 concrete and Fe415 steel.
   c) What do you mean by the concept of Strut-Tie model? Elaborate its application in design of deep beams with diagram.

Q 4.   (2X7=14)

   a) Derive the expression for yield line moment and ultimate load carrying capacity of a simply supported, isotropically reinforce rectangular slab.
   b) Design a simply supported square slab of 4m to support a service load of 4kN/m². Use M20 concrete and Fe 415 Steel.
   c) Determine the collapse load for a square slab fixed all around the edges with following data
     Size   = 5 m × 5 m

Reinforcement= 8 mm dia @150 c/c in both directions.
Total Depth   =130 MM
Effective cover= 30 mm.
Use M20 Concrete and Fe 415 steel.

Q 5.   (2X7=14)

a) Design the coal bunker as shown in the figure below. Use M20 concrete and Fe 415 steel.

b) A rectangular beam 300 mm × 500 mm is reinforced with 4-bars of 16 mm diameter at an effective depth of 470 mm. Two hanger bars of 12mm are provided on the compression face. If the beam is subjected to a service load of 15 kN/m, over a span of 5m then compute the short term and long term deflection of the beam. Use M20 concrete and Fe 415 steel.

c) A simple supported beam 500 mm × 700 mm subjected to a moment of 300 kNm, having a span of 6 m is reinforced with 5-25 mm diameter bar on the tension side, calculate the design surface crack width at the bottom of the tension face, if M20 concrete and Fe 415 Steel is used.
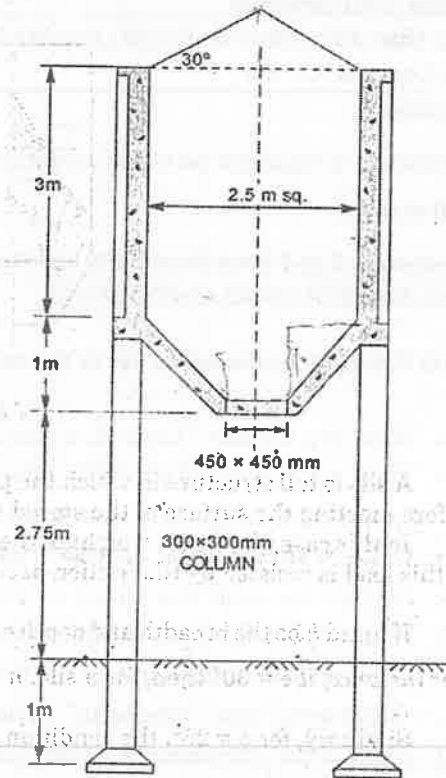
CENTRAL UNIVERSITY OF HARYANA

Term End Examination March 2023

Programme : M.Tech	
Semester : First	**Session: 2022-23**
Course Title : Advanced Solid Mechanics	*Max. Time: 3 Hours*
Course Code : MT CE 101	*Max. Marks: 70*

Instructions:

1. Question no. 1 has seven parts and students need to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 has three parts and student need to answer any two sub parts of each question. Each part carries seven marks.

Question No. 1.   **(4x3.5=14)**

a.   Elaborate the concept of octahedral stress and derive the equation for octahedral normal stress and octahedral shearing stress.

b.   Define shear stress and shear strain, and prove that shear stress is complimentary stress.

c.   Define Castigliano's Theorem's. Also discuss the Generalisation of Castigliano theorem for non linear body.

d.   Discuss Composite materials. Write the expression of Elastic Potential for composite materials.

e.   The state of stress at a point is such that: $\sigma_x = \sigma_y = \sigma_z = \tau_{xy} = \tau_{yz} = \tau_{zx} = P$. Determine the principal stresses and their directions.

f.   Consider the displacement field $u = [y^2i+3yzi+ (4+6x^2) k]*10^{-2}$ what are the rectangular strain component at the point P (1, 0, 2)? Use only linear terms.

g.   Prove the Kirchhoff's uniqueness theorem for an elastic body having specified displacement and force system.

Question No. 2   **(2x7=14)**

a.   At a point P the rectangular stress components are: $\sigma_x = 1$, $\sigma_y = -2$, $\sigma_z = 4$, $\tau_{xy} = 2$,
$\tau_{yz} = -3$, $\tau_{zx} = 1$. All in units of kPa. Find the principal stress and check for invariance.

b.   Define Principal Stresses and describe the characteristics of Mohr Circle for three-dimensional state of stress.

c.   Define hydrostatic and pure stress. The state of stress characterized by τ_{ij} is given below.

$$\sigma_x = 10, \sigma_y = 2, \sigma_z = 6, \tau_{xy} = 4, \tau_{yz} = 8, \tau_{zx} = 6$$

Resolve the given state into a hydrostatic state and pure shear state. Determine the normal

and shearing stresses on an octahedral plane. Compare these with σ_{oct} and τ_{oct} calculated for the hydrostatic and pure shear states. Are the octahedral planes for the given state, the hydrostatic state and pure shear state the same or are they different? Explain why.

Question No. 3 (2x7=14)

a. The displacement field in micro units for a body is given by:

$\mathbf{u} = (x^2 + y)\mathbf{i} + (3 + z)\mathbf{j} + (x^2 + 2y)\mathbf{k}$. Determine the principal strains at $(3, 1, -2)$ and the direction of the minimum principal strain.

b. Discuss the Saint-Venant's equation of Compactibility in details.

c. If a point have coordinate (X, Y, Z) and nearby point Q have coordinate:

$(X+U_x, Y+U_y, Z+U_z)$, Where U_x, U_y and U_z are displacement component. How will you determine the change in length of the line element PQ caused by deformation

Question No. 4 (2x7=14)

a. Discuss briefly the significance of various failure theories of materials and their suitability for application to elastic and brittle materials.

b. Develop the expressions for strain energy when an elastic member is subjected to axial force, shear force, bending moment and torsion

c. A cylindrical bar of 7cm diameter is subjected to a torque equal to 3400 Nm, and a bearing moment M. if the bar is at the point of failing in accordance with the maximum principal stress theory, determine the maximum bending moment it can support in addition to torque. The tensile elastic limit for the material is 207 MPa, and the factor of safety to be used is 3.

Question No. 5 (2x7=14)

a. Define Laminates. Write the expression for stress and strain components for unidirectional laminates.

b. A glass fiber reinforced nylon composite contains E-glass fiber 30% by volume. Calculate the percentage of load carried by the fibers when the composite is loaded. The moduli of elasticity of the constituents are E(glass) = 72 GPa, E (nylon) =2.8 GPa

c. Discuss the failure criteria of composite materials with the help of different theories of failure.

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Program: M. Tech. Session: 2022-23

Semester: First Max. Time: 3 Hours

Course Title: Information Retrieval Max. Marks: 70

Course Code: MT CS 105

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and students are required to answer any two parts of each question. Each part carries seven marks.

Q 1. (4X3.5=14)

a) What is Search Engine?

b) Explain the term term-weighting.

c) What is Web-Crawling?

d) Explain the term Information Filtering.

e) What do you mean by Relevance Scoring?

f) What is query expansion? How it affects the performance of IR system.

g) What is difference between search and recommendation?

Q 2. (2X7=14)

a) Describe the various components of Information Retrieval System with their working.

b) Differentiate between Web Search and Information Retrieval.

c) What is the role of Artificial Intelligence in Information Retrieval?

Q3. (2X7=14)

a) Explain the Architecture of Vector-Space Retrieval Model.

b) Define the following terms with an appropriate example:

   i) TF-IDF weighting ii) Cosine Similarity

c) What is the importance of relevance feedback? How is it useful in query expansion?

Q 4. (2X7=14)

a) Describe the web challenges for Information Retrieval.

b) Explain the Spidering Algorithm. Write short note on restricting Spidering.

c) What is focused Spidering? Also explain different types of focused spidering.

Q 5. (2X7=14)

a) What is text mining and how it is different from text classification?

b) Explain Content-Based recommending with its advantages and disadvantages.

c) What is Expectation Maximization Clustering? Also explain the Expectation Maximization Algorithm.

CENTRAL UNIVERSITY OF HARYANA

End Semester Examinations March 2023

Programme: M.Tech. (CSE)   **Session: 2022-23**
Semester: First   **Max. Time: 3 Hours**
Course Title: Advanced Databases   **Max. Marks: 70**
Course Code: MT CS 101

Instructions:
1. Question no. 1 has seven parts and students need to answer any four. Each part carries three and half Marks.
2. Question no. 2 to 5 have three parts and student need to answer any two parts of each question. Each part carries seven marks.

Q1			(4X3.5=14)
	A	What is data independence?	
	B	Define Temporal databases.	
	C	What are the benefits of XML over HTML?	
	D	Differentiate between inter-query and intra-query parallelism.	
	E	What is the minimal normal form that a relation must satisfy? Justify your answer.	
	F	How a query is expressed in XQuery?	
	G	Explain shadow paging.	
Q2			**(2X7=14)**
	A	Give an example of a serializable schedule with two transactions such that the order in which the transactions commit is different from the serialization order.	
	B	What is concurrency control and why is it required? Discuss the way to handle concurrency control in distributed systems.	
	C	What is normalization and why is it required? Discuss its various forms with suitable example.	
Q3			**(2X7=14)**
	A	Discuss horizontal and vertical fragmentation techniques, with the help of examples.	
	B	Draw and discuss the architecture of parallel and distributed databases.	
	C	Explain clearly in what way designing an object oriented database is different from relational database? What are the main features of OODBMS.	
Q4			**(2X7=14)**
	A	With state transition diagram, explain two-phase commit distributed recovery protocol.	
	B	What is checkpoint? Explain its significance in database management with suitable example.	
	C	What is semi-structured data? How it differs from structured data? Also discuss the usage of XML in handling semi-structured data.	
Q5			**(2X7=14)**
	A	Discuss the representation of multidimensional data and the operations supported by OLAP.	
	B	Differentiate between OLAP and OLTP.	
	C	Write a technical note on Mobile Databases.	

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Programme: M.Tech CSE   **Session: 2022-23**

Semester: First   **Max. Time: 3 Hours**

Course Title: Distributed Systems   **Max. Marks: 70**

Course Code: MT CS-109

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and students are required to answer any two parts of each question. Each part carries seven marks.

Q 1.   (4X3.5=14)

a) What is Distributed Systems? Explain its advantages.

b) Differentiate between RPC and RMI.

c) What is mutual exclusion in Distributed Systems?

d) Explain the need of distributed Transactions.

e) What is clock Synchronization?

f) Explain the term distributed deadlock.

g) Differentiate between remote file transfer and remote file access.

Q 2.   (2X7=14)

a) Explain the issues and challenges in distributed systems with examples.

b) Write the applications of Distributed Computing.

c) What is dynamic port mapping in Remote Procedure Call (RPC)? Explain the algorithm.

Q3.   (2X7=14)

a) Write and explain the Berkeley algorithm to deal the faulty clocks.

b) How the client-server architecture is different from peer-to-peer architecture? Discuss.

c) What is token based and non token based algorithm? Explain.

Q 4.   (2X7=14)

a) What is the Phantom deadlock? Explain.

b) Discuss the edge chasing approach to deadlock detection in distributed system.

c) What is Distributed Shared Memory (DSM)? Compare Massage passing and DSM.

Q 5.   (2X7=14)

a) Draw and Discuss the architecture of Network file system (NFS).

b) What is nested transaction? Explain the hard mount and soft mount.

c) Explain the two-phase commit protocol used in distributed transactions.

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Term End Examinations March 2023

Programme:	M.Tech.	**Session: 2022-23**
Semester:	First	**Max. Time: 3 Hours**
Course Title:	ADVANCED COMPUTER NETWORK	**Max. Marks: 70**
Course Code:	MT CS 102	

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and students are required to answer any two parts of each question. Each part carries seven marks.

Q 1. (4X3.5=14)

a) What is CSMA and CSMA/CD?

b) What is delay in network?

c) Write a short note on throughput.

d) Define Classfull addressing.

e) Differentiate between Static Vs Dynamic routing.

f) Define ESP.

g) Explain Token ring.

Q 2. (2X7=14)

a) What is IP address. Differentiate between IPv4 and IPv6.

b) Explain seven layer architecture and TCP/IP suit of protocol.

c) Differentiate between Uni polar, Polar, Bipolar coding schemes.

Q 3. (2X7=14)

a) Briefly explain the HTTP protocols. Also discuss HTTP with respect to non-persistent connection and its drawback.

b) Discuss the different problems of reliable data transfer protocol rdt2.0. Also discuss the solution of the discussed problem.

c) Draw & Discuss the UDP segment structure.

Q 4. (2X7=14)

a) Discuss the following Special addresses

1. Limited broadcast address

2. Loop back address

3. Multicast address

4. Direct broadcast address

b) An organization is granted a block of addresses with the beginning address 14.24.74.0/24. The organization needs to have 3 sub blocks of addresses to use in its three subnets as given below.

1. One sub-block of 120 addresses
2. One sub-block of 60 addresses
3. One sub-block of 10 addresses

C.) Explain the various routing protocols RIP,BGP,OSPF,IP over ATM.

Q 5.   (2X7=14)

a) What is MAC, Pure ALOHA & slotted ALOHA? Also draw a diagram for proper explanation.

b) Explain digital signature and digital certificate.

c) Discuss the network security mechanism at various layers of OSI model.