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Question Paper Code: BCS002



INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

DATA STRUCTURES AND PROBLEM SOLVING
(Computer Science and Engineering)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

- (a) Differentiate between linear and non-linear data structures with an example each. [7M]
(b) Explain the queue ADT by using arrays. [7M]
- (a) How do you analyze the space complexity of an algorithm? [7M]
(b) Illustrate the steps to delete a given element from a doubly linked list. [7M]

UNIT – II

- (a) How is collision resolution done using separate chaining in hash tables? [7M]
(b) Explain with suitable example how hash table collisions are resolved using quadratic probing. [7M]
- (a) Explain the usage of hash tables to represent a dictionary. [7M]
(b) What is open addressing? Explain with an example. [7M]

UNIT – III

- (a) Explain the binary tree ADT. Write different tree traversals with an example. [7M]
(b) What is a threaded binary tree? Give an example. [7M]
- (a) What is a graph? Explain any three graph representations. [7M]
(b) Write an algorithm for the breadth first search of a graph. [7M]

UNIT – IV

- (a) What is the difference between a binary search tree and a binary tree? How do you find the parent of a given node in a binary search tree? [7M]
(b) How do you find the smallest and largest numbers in a binary search tree? [7M]
- (a) What is an AVL tree? Explain different rotations involved in it. [7M]
(b) Create an AVL tree by repeated insertion of the following elements : [7M]
50, 20, 21, 15, 35.

UNIT – V

9. (a) Illustrate the KMP algorithm with an example. [7M]
(b) Draw the Huffman code tree for the following data source with five symbols: [7M]

Symbol Frequency

A 24

B 12

C 10

D 8

E 8

What is the length of the data source before and after coding consider 3 bits per character

10. (a) What is a B tree? Explain the insertion operation into a B tree with an example. [7M]
(b) Explain the working of join and range queries in an R tree. [7M]

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

HIGH PERFORMANCE ARCHITECTURE

(Computer Science and Engineering)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) List and explain various hazards of compiling for scalar pipeline. [7M]
- (b) Using the simple procedure for dependence construct all the dependences for the loop nest below and provide [7M]
 - i. direction vector(s),
 - ii. distance vector(s)
 - iii. loop level for each one.

```

DO K =1,100
DO J = 1, 100
DO I = 1, 100
A(I+1,J+2,K+1) = A(I,J,K+1) + B
ENDDO
ENDDO
ENDDO

```
2. (a) Is the following example violates the Bernstein's conditions? Justify. [7M]

```

PARALLEL DO I= 1 , N
A(I+1) =A(I) +B(I)
ENDDO

```
- (b) List out preliminary transformations required to make dependence testing more accurate loop normalization. If there is a loop carried dependence, then that loop cannot be parallelized? Justify. [7M]

UNIT – II

3. (a) For the following example, construct valid breaking conditions. [7M]

```

DO I =1,100
S A(I+IX) = A(I) + C
ENDDO

```

(b) Identify and define the subscripts which are ZIV, SIV and MIV from the following example. [7M]

```
DO I
DO J
DO K
S1 A(I, J) = A(I, K) + C
ENDDO
ENDDO
ENDDO
```

4. (a) Explain about the goals of dependence testing? [7M]

(b) Define conservative testing? Explain in detail with an example. [7M]

UNIT – III

5. Explain generalized parallel code generation algorithm with loop shifting and recurrence breaking. [14M]

6. (a) For the following example draw the dependence graph and generate the scalar expansion code [7M]

```
DO I = 1, N
S1 T = A(I)
S2 A(I) = B(I)
S3 B(I) = T
ENDDO
```

(b) Explain the use of loop interchange for parallelization. What is the role of loop skewing? [7M]

UNIT – IV

7. (a) Describe how loop unroll-and-jam is used in conjunction with scalar replacement to lower the balance of a memory-bound loop. [7M]

(b) Distinguish between the write-through and write-back policies pointing out their merits and demerits? [7M]

8. How Forward and Backward branch removal will be done with If-conversion. [14M]

UNIT – V

9. (a) Identify how data dependence is calculated if registers are reused and how can we improve register reuse in loop carried and loop independent. [7M]

(b) Write a procedure to eliminate the scalar copies in iterations. [7M]

10. (a) The problem of scalar register allocation has essentially been solved by the register coloring techniques? Justify. [7M]

(b) How data dependence can affect memory hierarchy management. [7M]





INSTITUTE OF AERONAUTICAL ENGINEERING (Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

ADVANCED WEB TECHNOLOGIES (Computer Science and Engineering)

Time: 3 Hours

Max Marks: 70

**Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only**

UNIT – I

1. (a) Consider the following Table 1. Write HTML code for creating this table and change the table's border to 5 pixels, and make it red. [7M]

Table 1

First Name	Last Name	Points
Jill	Smith	50
Eve	Jackson	94

- (b) Explain briefly Text Alignment and Text Decoration in CSS with suitable examples. [7M]
2. (a) Write a Java Script program to find the most frequent item of an array. [7M]
Sample array : `var arr1=[3, 'a', 'a', 'a', 2, 3, 'a', 3, 'a', 2, 4, 9, 3];`
Sample Output : a (5 times)
- (b) Discuss briefly the following string manipulation methods of Java Script : `slice()` and `split()`. [7M]

UNIT – II

3. (a) Write a HTML source code to define a table that contains two labels and two text fields. One of the labels is Employee and the other is Phone. There must also be a submit button. Write a Java servlet program that allow you to read the names and values of parameters. [9M]
- (b) What is MIME type? [5M]
4. (a) Define an XML document to represent two books contained in a bookstore. Each book element contains fields that describe the book. Write code snippet to parse the XML document using DOM. [10M]
- (b) Explain briefly XML HTTP Request object. [4M]

UNIT – III

5. (a) What is URL Rewriting? Illustrate with an example. [9M]
- (b) What is JSP action element? Explain in detail. [5M]

6. (a) Explain the concept of useBean tag with a suitable example. [6M]
(b) Assume that you have Employee table in EMP database (MySQL) with fields empid, first name, last name and age. Write a JSP script to execute SQL SELECT statement. [8M]

UNIT – IV

7. (a) Discuss about Model View Controller? Explain with a neat diagram. [6M]
(b) What are Struct tag libraries? Explain briefly HTML Tags and Logic Tags with an example for each. [8M]
8. (a) Discuss in detail about Struct Internationalization? [6M]
(b) Bring out the significance of ForwardAction with a suitable example. [8M]

UNIT – V

9. (a) “An SOA promotes modularity because services are loosely coupled. This modularity has positive implications for the development of composite applications” – Comment [5M]
(b) What are SOAP Intermediaries and SOAP Actors? With a neat diagram illustrate SOAP message exchange model with intermediaries. [9M]
10. (a) Illustrate the Web Services Life Cycle with a neat diagram . [9M]
(b) Discuss the roles and relationships between Service Provider, Broker and Requestor. [5M]

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Question Paper Code: BCS212



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

BIG DATA ANALYTICS

(Computer Science and Engineering)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- (a) Discuss various challenges that affect the Big Data phenomenon. Compare and contrast ACID (Atomicity Consistency Isolation Durability) and BASE (Basically Available Soft state Eventual consistency). [7M]

(b) You have taken charge of a model that has been run previously on a small scale every day but now needs to be run on millions of customers daily and given to analysts who will proactively contact customers. List out the tasks and their priority to ensure that your model work on large data as well. [7M]
- (a) Define Bid Data Analytics and state what made it powerful? What are the benefits of the Master Data Management (MDM) solution? [7M]

(b) If an organization retains large data which is not evaluated or analyzed, will not benefit the organization. Explain how Big Data Analytics would benefit the organization in this scenario. [7M]

UNIT – II

- (a) Describe the drastic changes in the environment of data analysis with Big Data by comparing different analytical tools for analyzing data. [7M]

(b) State the reason for the problem and procedure to overcome, when an attempt is made to modelling a task and it seems that the required level of accuracy is not being achieved. [7M]
- (a) Define the drivers for Big Data - Velocity, Variety and Viscosity with at least two Big Data analytics applications in detail. [7M]

(b) Describe the method by which companies analyze customer data or other types of data in an effort to identify patterns and discover relationships between different data elements. [7M]

UNIT – III

- (a) Does Hadoop replace existing Data Warehouse? (OR) Hadoop can be an extremely valuable extension to your data warehouse? [7M]

(b) What is MapReduce? How Map Reduce works in Hadoop? What are the components and architecture of MapReduce. [7M]

6. (a) What are the most commonly defined input formats in Hadoop? What is a block and block scanner [7M]
- (b) Explain what happens if during the PUT operation, HDFS block is assigned a replication factor 1 instead of the default value 3. [7M]

UNIT – IV

7. (a) List out the writable data types used by Hadoop API that have the same features as default java class. [7M]
- (b) How to copy a file into HDFS with a different block size to that of existing block size configuration? [7M]
8. (a) Can Hadoop be used to create distributed clusters, based on commodity servers, which provide low-cost processing and storage for unstructured data, log files and other forms of Big Data explain with suitable example. [7M]
- (b) HDFS stores data using commodity hardware which has higher chances of failures. So, How HDFS ensures the Fault Tolerance capability of the system? [7M]

UNIT – V

9. (a) You are analyzing a cohort of visitors to two websites. You know that the cohort in website A consists of 576 male visitors and 768 female visitors. Assuming all visitors also visit website B, what is the probability that a randomly selected visitor is female? In social network analysis, what is the definition of a clique? [7M]
- (b) How does creating a social network marketing plan different from traditional marketing plan? What are the types of results from mobile analytics? [7M]
10. (a) Describe the future of sentiment analysis. List out the techniques used in sentiment analysis. [7M]
- (b) Write the steps and procedure to perform sentiment analysis on the tweets downloaded from Twitter. [7M]



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Question Paper Code: BCS001



INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

FOUNDATIONS OF DATA SCIENCES
(Computer Science and Engineering)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Discuss the stages of a data science project. [10M]
(b) What is difference between data frame and a matrix in R? [4M]
2. (a) Write R script to check whether the given number is prime or not? [7M]
(b) Discuss the issues to be considered in writing out a data frame to a text file. [7M]

UNIT – II

3. (a) What are the benefits of NoSQL over RDBMS. [4M]
(b) State different ways to access different types of data files? Discuss the relevant packages and methods to access .csv, exl files. [10M]
4. (a) Distinguish simple and multiple regression analysis and its applications working with numerical and categorical data? [7M]
(b) Describe the functions used in R for Correlation analysis and Covariance analysis with examples. [7M]

UNIT – III

5. (a) Discuss some common classification methods [7M]
(b) Describe the process to create and evaluate the data model for the given data. To predict whether an email is a spam and should be delivered to junk folder. Suggest some data model. [7M]
6. (a) Discuss k-means algorithm with a suitable example. [6M]
(b) Describe the limitations of the perception model. How to create and evaluate a data model? Describe with one case study. [8M]

UNIT – IV

7. (a) Give the basic structure of neural network and different types of ANN with real time examples. [7M]

- (b) Compare the learning algorithms with example in terms of problem nature, accuracy and error rate. [7M]
8. (a) State different types of learning algorithms with suitable example. Elaborate lazy learning algorithms [7M]
- (b) Discuss the difference of error in two hypotheses. Differentiate the MAP and ML hypothesis. [7M]

UNIT – V

9. (a) What is knitr? How to produce milestone documentation using knitr with an example for Mark-down? [7M]
- (b) How to write effective comments in R to generate effective documentation [7M]
10. (a) Generalize the graphical analysis in data analysis? List the various plots in R and explain in detail. [8M]
- (b) List out different plots with relevant package to explore and summarize the numerical text data in R. [6M]

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

EMBEDDED C

(Common for Computer Science and Engineering | Embedded Systems)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) Mention typical real time examples of embedded applications? Which operating system is used for embedded system and why? [7M]
- (b) Explain the process of developing embedded software with example? Develop an embedded C program for simple super loop? [7M]
2. (a) Design and discuss the external interface of the standard 8051 microcontroller with a neat sketch? Why crystal frequency of 8051 is 11.0592MHz? [7M]
- (b) Define interrupt? Elaborate the process of interrupt handling in an embedded system with schematic representation? [7M]

UNIT – II

3. (a) Describe various techniques for reading from port pins? Develop an embedded C program for super loop application which copies the value from Port1 to Port2? [7M]
- (b) Illustrate the need for pull-up resistor with a schematic representation? Develop an embedded C program for reading and writing bits (simple version). [7M]
4. (a) List out bitwise operators of C? Develop an embedded C program for reading and writing bits by using generic version method. [7M]
- (b) Explain the concept of switch bounce with example and develop an embedded C program for reading switch inputs? [7M]

UNIT – III

5. (a) Develop an embedded C program for [7M]
 - i. Project header (main.h)
 - ii. port header (port.h) using 8051 microcontroller?
- (b) Illustrate the process of goat-counting using switching concept? Develop an embedded C program for restructuring the gate counting? [7M]
6. (a) Discuss about file based C class? Develop an embedded C program for file based C class using 8051 microcontroller? [7M]
- (b) Develop an embedded C program for restructuring the “Hello World” using 8051 microcontroller? [7M]

UNIT – IV

7. (a) Elaborate how to create hardware delays using Timer 0 and Timer 1? Develop an embedded C program for testing a hardware timeout? [6M]
- (b) Discuss the special function registers TMOD and TCON? Explain each bit in detail? Generate a 50ms hardware delay for 12MHz using 8051 microcontroller. [8M]
8. (a) Elaborate the process of creating a portable hardware delay? Discuss its applications? Develop an embedded C program for creating hardware timeouts? [7M]
- (b) Explain the need for timeout mechanism? Develop an embedded C program for a more reliable switch interface? [7M]

UNIT – V

9. (a) Design an intruder alarm system using a small art gallery? Mention different operating states of control panel for alarm system? [7M]
- (b) Describe in detail the key software components used in intruder alarm system? Discuss its usages in intruder alarm system? [7M]
10. (a) Explain the working principle of main control panel for alarm system with neat sketch? Develop an embedded C program for project header and port header file of an intruder alarm system using 8051? [7M]
- (b) Develop an embedded C program for an intruder alarm system using 8051 microcontroller? [7M]

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Question Paper Code: BES003



INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

COMPUTER ARCHITECTURE
(Embedded Systems)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Write briefly about the advantages of parallelism. [7M]
(b) Discuss about principal of locality in detail. [7M]
2. (a) Show that the ratio of the geometric means is equal to the geometric mean of the performance ratios, and that the reference computer of SPEC Ratio matters not. [6M]
(b) Write short notes on [8M]
 - i. Desktop bench marks
 - ii. Server bench marks.

UNIT – II

3. (a) Describe how to overcome Data Hazards with Dynamic Scheduling. [7M]
(b) Explain the basic VLIW approach. [7M]
4. (a) Explain static branch prediction and list out its techniques? [5M]
(b) List out the limitations for hardware and software speculation to exploit ILP? [9M]

UNIT – III

5. (a) Briefly explain the different Cache performance techniques that can be used to improve miss penalty and miss rate? [8M]
(b) List and briefly explain the six basic cache optimizations. [6M]
6. (a) Explain how the processes can be protected via virtual memory. [8M]
(b) Difference between symmetric shared memory and distributed shared memory. [6M]

UNIT – IV

7. (a) Explain the concept of RAID and explain various levels. [8M]
(b) List and explain various types of storage systems. [6M]

8. (a) Explain how IO Devices are connected to CPU/Memory using buses. [10M]
(b) Explain the terms [4M]
 i. dependability
 ii. error latency

UNIT – V

9. (a) Describe the designing procedure for a cluster. [7M]
(b) What are the media used for interconnecting networks? [7M]
10. (a) Explain the practical issues in interconnecting networks? [7M]
(b) Discuss the pros and cons of cost of clusters. [7M]

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Question Paper Code: BES204



INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

HARDWARE AND SOFTWARE CO-DESIGN
(Embedded Systems)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) Discuss about allocation and partitioning in detail. [7M]
(b) Write the differences between RISC and CISC processors along with examples. [7M]
2. (a) Write short notes on heuristic algorithms give an example. [7M]
(b) Explain scheduling in generic co-design methodology. [7M]

UNIT – II

3. (a) Explain about system communication infrastructure with a neat block diagram. [7M]
(b) Explain about Architecture of 8051 Micro Controller. [7M]
4. (a) Write short notes on architectures for high performance control with a neat block diagram. [7M]
(b) Explain in detail about Aptix Prototyping System. [7M]

UNIT – III

5. (a) Explain the design tools for embedded processors. [7M]
(b) Explain compiler techniques for specialized architectures in detail. [7M]
6. (a) Write short notes on Modern Embedded architectures. [7M]
(b) Discuss about Compiler validation in detail. [7M]

UNIT – IV

7. (a) Explain Physical realization of state variables. Give an example. [7M]
(b) Write short notes on Verification tools of design verification. [7M]
8. (a) Explain Design and Co-design concepts of Hardware and Software Co-design. [7M]
(b) Explain open verses closed operations of design process. [7M]

UNIT – V

9. (a) Explain about Co-simulation Models with neat sketches. [7M]
(b) Explain about Multi- Language design and specify its classifications based on validation. [7M]
10. (a) Briefly explain about Synthesis Intermediate forms. [7M]
(b) write the differences between homogeneous and heterogeneous specification. [7M]



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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

POWER ELECTRONIC CONTROL OF AC DRIVES

(Power Electronics and Electric Drives)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) Draw and explain the power circuit of a single phase semi converter feeding a separately excited dc motor. Explain with typical voltage and current waveforms the operation in continuous armature current. [7M]
- (b) A 200V, 875RPM, 150A Separately excited DC motor has armature circuit resistance and inductance of 0.06Ω . The motor is controlled by a single phase fully controlled rectifier with source voltage of 220V, 50 Hz. For continuous conduction operation calculate [7M]
 - i. firing angle for rated motor torque and 750RPM
 - ii. firing angle for rated motor torque and -500RPM
2. (a) Draw and explain the power circuit of a single phase fully controlled converter feeding a separately excited dc motor. Explain with typical voltage and current waveforms the operation in discontinuous conduction. [7M]
- (b) The speed of a 10HP, 210V, 1000RPM separately excited dc motor is controlled by a single phase full converter. The rated motor armature current is 30 A and armature resistance is 0.25Ω . The ac supply voltage is 230V. The motor voltage constant is $K_a\phi = 0.172\text{V/RPM}$. Assume that sufficient inductance is present in the armature circuit to make the motor current continuous and ripple free. For a firing angle $\alpha = 45^\circ$ and rated motor current determine [7M]
 - i. The motor torque
 - ii. The speed of the motor

UNIT – II

3. (a) Explain the principle of operation of dual converter control of separately excited DC motor in simultaneous current control method. [7M]
- (b) A 220V, 750RPM, 200A separately excited DC motor has an armature resistance of 0.05Ω . Armature is fed from a three phase dual converter with circulating current control. The A.C source voltage is 400V(Line). When motor operates in forward motoring converter A works as a rectifier and B as an inverter. Calculate firing angles of converters A & B for the following operating points for the following assuming continuous conduction. [7M]
 - i. Motoring operation at rated torque and -600RPM
 - ii. Regenerative braking operation at rated torque and 600RPM

4. (a) Explain the principle of operation of a three phase full wave controlled bridge rectifier with R-L load and ideal supply with neat circuit diagram and waveforms. [7M]
- (b) Discuss the principle of operation of a three phase fully controlled converter control of separately excited d.c motor. [7M]

UNIT – III

5. Draw the block diagram of a DC motor drive and derive the transfer function of the following sub-systems. [14M]
- DC motor and load
 - Converter
 - Current and speed controller
 - Current feedback
 - Speed feedback
6. (a) Draw the block diagram for the closed loop control of the two quadrant DC motor drive with field weakening using a phase controlled converter and explain the speed control below and above the rated speed. [7M]
- (b) Explain the control modeling of the three phase fully controlled converter. [7M]

UNIT – IV

7. (a) Explain in detail about chopper with regenerative capability with circuit diagram. [7M]
- (b) Describe the principle of operation of a two quadrant chopper with neat circuit diagram and necessary waveforms. [7M]
8. Explain the methods of hysteresis control and PWM control for controlling current in DC motor drives. [14M]

UNIT – V

9. Describe the methods of hysteresis control and PWM control for controlling current in DC motor drives. [14M]
10. Draw the flowchart for the dynamic simulation of the chopper controlled dc motor drive and explain the dynamic performance of a chopper controlled separately excited dc motor drive for a step command in speed reference, in normalized units with necessary wave forms. [14M]

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

AC TO DC CONVERTERS

(Power Electronics and Electric Drives)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) Write a short note on MOS controlled Thyristor(MCT). [7M]
- (b) What are the specifications of Thyristor switch? [7M]
2. (a) Write a short note on Integrated Gate Commutated Thyristors (IGCT)? [7M]
- (b) Explain the various power losses in Thyristor switches. [7M]

UNIT – II

3. (a) Explain continuous mode of operation in 3ϕ semi converter with R load. [7M]
- (b) A three phase semi converter is used to charge 200V battery from 220V, 50Hz AC supply. Assume internal resistance of the battery is 0.5 ohm and an inductance is connected in series with a battery so that 10A constant charging current flows. Determine the firing angle of the converter, conduction period of each thyristor and input power factor? [7M]
4. (a) Explain discontinuous mode of operation in 3ϕ full converter with R load. [7M]
- (b) What is the use of freewheeling diode in converter circuits? [7M]

UNIT – III

5. (a) Explain the operation of 3ϕ AC voltage controller with delta connected R load. [7M]
- (b) A single phase electronic tap changer is feeding from 230V, 50Hz AC supply and is connected with a load of $R = 10$ ohm and the turns ratio from primary to secondary is unity. If the firing angle of the upper group thyristors is 45° then determine [7M]
 - i. RMS value of the output voltage
 - ii. RMS value of the upper group thyristors current
 - iii. VA rating of the transformer
 - iv. Power factor
6. (a) Explain the operation of 3ϕ bridge type cycloconverter. [7M]
- (b) A 6 pulse cycloconverter is supplied from 440V, 50Hz AC supply and it is delivering 50A to single phase resistive load. The source inductance is 1.5mH. Determine the output voltage at firing angles 0° and 45° . [7M]

UNIT – IV

7. (a) Explain the operation of 1ϕ half converter for RL load in discontinuous mode of operation. [7M]
- (b) Explain in detail about the single phase Dual Converter? Sketch the various waveforms of dual converter? [7M]
8. (a) Explain the operation of 1ϕ full converter for RLE load in discontinuous mode of operation? [7M]
- (b) A single phase full controlled converter is connected to 220V, 50Hz AC supply. A load of $R = 10$ ohm is connected in series with large inductance and the load current is ripple free. If the firing angle is 60° . Determine different parameter of the converter. [7M]

UNIT – V

9. (a) Explain the operation of buck boost converter with a neat sketch. [7M]
- (b) A buck boost regulator has input voltage of $V_s = 12V$. The duty cycle, $k=0.25$ and the switching frequency is 25kHz. The inductance $L = 150\mu H$ and the filter capacitance $C = 220\mu F$. The average load current is 1.25A. Determine [7M]
- i. Average output voltage
 - ii. Peak to peak output voltage ripple in capacitor
 - iii. Peak to peak ripple current in inductor
 - iv. Critical values of L and C
10. (a) Explain the buck converter in detail with a neat sketch? [7M]
- (b) A boost regulator has input voltage of $V_s = 5V$. The output voltage is 15V, the load current is 0.5A and the switching frequency is 25kHz. The inductance $L = 150\mu H$ and the filter capacitance $C = 220\mu F$. Determine [7M]
- i. Duty cycle
 - ii. Ripple current of inductor
 - iii. Peak current of the inductor
 - iv. Ripple voltage of the capacitor
 - v. Critical values of L and C



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Question Paper Code: BPE003



INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

SPECIAL MACHINES AND CONTROLLERS
(Power Electronics and Electric Drives)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Distinguish between Axial and Radial air gap Synchronous Reluctance Motors with relevant diagrams. [7M]
(b) Compare the advantages of Synchronous Reluctance Motor over Permanent Magnet Machines. [7M]
2. (a) Draw and discuss the torque speed characteristics of Single Phase Synchronous Reluctance Motor. [7M]
(b) Explain the construction and principle of Vernier Motor. [7M]

UNIT – II

3. (a) Explain in detail about the constructional features of Single Stack Variable Reluctance Motor. [7M]
(b) Calculate the step angle of a single stack 4 phase, 8/6 pole Variable Reluctance Stepper. What is its Resolution. [7M]
4. (a) Explain the principle of operation of Stepper motor, which can be operated with combined principles of Permanent magnet and Variable Reluctance motors in order to achieve a small step angle & high torque from a small size. [7M]
(b) Explain in detail linear and non-linear analysis of Stepper motor. [7M]

UNIT – III

5. (a) Predict the torque speed characteristics of Switched Reluctance motor [9M]
(b) List out basic requirements of Power Semiconductor Switching Circuits for SRM. [5M]
6. (a) Discuss microprocessor based control of Switched Reluctance Motor Drive. [8M]
(b) Determine the step angle of 3-phase switched reluctance motor having 12 stator poles and 8 rotor poles. Calculate Commutation frequency at each phase at a speed of 600 rpm. [6M]

UNIT – IV

7. (a) Draw the torque speed characteristics of Brushless Permanent Magnet Square Wave DC motor. [7M]
- (b) A brushless Permanent Magnet DC Motor has no load speed of 6000 rpm ,when connected to 120 V DC supply. $R_a = 2.5 \Omega$. Rotational & Iron losses may be neglected. Determine the speed when supply voltage is 60 V and the torque is 0.5 NM. No load speed when supply voltage is 120 V, is 6000 rpm. [7M]
8. (a) Derive the general EMF equation of Permanent Magnet Brushless DC Motor. [7M]
- (b) Give the merits & demerits of Brushless Permanent Magnet DC Motors. [7M]

UNIT – V

9. (a) Draw the phasor diagram of Brushless Permanent Magnet Synchronous Motor. [7M]
- (b) Derive the torque equation of an ideal Brushless Permanent Magnet Sine Wave Motor. [7M]
10. (a) Explain about microprocessor based control of permanent magnet synchronous motor. [7M]
- (b) Identify the applications of Permanent magnet Synchronous Motor. [7M]

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Question Paper Code: BPE701



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

RENEWABLE ENERGY SYSTEMS (Common to ES|(CAD/CAM)|STE)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- (a) Classify the various configurations of solar cells and explain PIN solar cell with neat sketch. [7M]

(b) Explain characteristics of photo current and derive the expression for total current of solar cell. [7M]
- (a) Describe various physical properties and application of superconducting materials in electrical systems. [8M]

(b) A $2\text{cm} \times 2\text{cm} \times 0.05\text{mm}$ solar cell has the I-V characteristic with approximate short circuit current of 0.166 A and open circuit voltage of 0.6V. The I-V characteristic is constant at 0.166A up to 0.5V. Calculate the fill factor, assuming solar radiation to occur at the intersection of the two straight lines. [6M]

UNIT – II

- (a) What are the classifications of MHD systems? Describe any one of the MHD system with neat sketch? [7M]

(b) What are the important factors to be considered while selecting materials for MHD generator. [7M]
- (a) With the help of neat sketch, discuss different types of rotors used in wind turbines. [9M]

(b) Calculate the maximum power output of a 15m diameter wind turbine at one atmospheric pressure and wind speed of 12m/s. [5M]

UNIT – III

- (a) Explain with neat sketch, the single basin double effect tidal power plant. [8M]

(b) Illustrate the merits and demerits of tidal power. [6M]
- (a) Describe with block diagram of wave energy conversion system and vertex motion of wave. [8M]

(b) Explain working principle of open cycle OTEC system and its applications. [6M]

UNIT – IV

7. (a) Describe with block diagram, “coal liquefaction process”. [7M]
(b) Discuss the thermo chemical conversion and ethanol production from biomass. [7M]
8. (a) Discuss geothermal power generation using binary cycle. [7M]
(b) Describe thermo electric energy conversion. [7M]

UNIT – V

9. (a) Give a complete description of the working and constructional features of a Phosphoric Acid fuel cell. [7M]
(b) Distinguish between battery and fuel cell. [7M]
10. (a) What is the principle of battery and classify various batteries briefly. [7M]
(b) Describe the construction and reaction taking place in a lead acid storage battery during charge and discharge. [7M]

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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

THEORY OF ELASTICITY AND PLASTICITY

(Structural Engineering)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) Derive a compatibility equation for plane strain problem considering deformation in x-y plane only. [8M]
- (b) Explain Airy's stress function and its use in elastic analysis of materials. [6M]
2. (a) Derive an expression to give the relation between three elastic constants? [7M]
- (b) Briefly explain the Principal stresses and Principal plane for 2D element? [7M]

UNIT – II

3. (a) Derive an expression by elastic theory to find the deflection of cantilever beam of uniform rigidity (EI) and length, L if beam is applied point load =P at free end [8M]
- (b) What problem of plane stress is solved by the stress function : φ given below, where $\varphi = \frac{3F}{4C} [xy - \frac{xy^3}{3C^2}] + \frac{P}{2} [y^2]$ applied to a beam, width = unity and depth = 2C and P = load applied. Assume body forces are absent. [6M]
4. (a) Derive an expression to find the strain components in polar coordinates for 2D problems. [8M]
- (b) Derive an expression for pure bending of curved beams? [6M]

UNIT – III

5. (a) Derive an expression to find the equilibrium conditions of component stresses in 3D elements subjected to normal and shear stresses? [8M]
- (b) Explain the following principals in the theory of elasticity. [6M]
 - i. Uniqueness theorem of 2D elements
 - ii. Stress invariants in 3D elements
6. (a) Determine the principal values and principal directions for the following stress function σ_y applied at a point with respect to the axes 0, X1, X2, X3 [8M]

$$\sigma_y = \begin{pmatrix} 5 & 0 & 0 \\ 0 & -6 & -12 \\ 1 & -12 & 1 \end{pmatrix} \text{MPa}$$

- (b) Explain the following concepts of elastic deformation of materials [6M]
- i. Homogeneous deformation in 3D elements
 - ii. Principal axis of strain rotation

UNIT – IV

7. (a) Derive Torsional equation for prismatic bar of non circular section by stress function method? Also explain how it is applied to the triangular sections? [8M]
- (b) Briefly explain the following [6M]
- i. Membrane analogy
 - ii. Hydro dynamical analogy
8. A wide flange section of I-beam, overall depth 200mm, thickness of web 20mm and flange 30mm, width of top and bottom flange each 150mm is fixed at one end and free at other end over a span 6m is subjected to torsion moment 3kN-m at free end. Calculate the Normal and Shear stress due to bending and maximum shear due to torsion. What is the angle of twist at free end? Assume : Young's modulus $E = 2 \times 10^5$ MPa, Poisson's ratio : $\mu = 0.25$. [14M]

UNIT – V

9. (a) Discuss Von Mises yield conditions for failure? [7M]
- (b) Write the assumptions made in plastic theory? [7M]
10. (a) Explain the terms used in the plasticity theory [6M]
- i. Plastic hinge
 - ii. Tangent modulus
- (b) A thick cylinder of internal radius 400mm and external radius 500mm subjected to internal pressure. If the yield stress of the material 250MPa, determine the stresses when the whole of the cylinder has plastic front of radius 225mm [8M]



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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

ADVANCED REINFORCED CONCRETE DESIGN (Structural Engineering)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

IS 456 - 2000 and SP - 16 Charts are Permitted

UNIT – I

1. (a) Write the assumptions in limit state of collapse in flexure. [6M]
 (b) Find the M.R. of a singly reinforced concrete beam of 200 mm width and 400 mm effective depth, reinforced with 3 bars of 16 mm dia. of Fe 415 steel. Take M 20 concrete. Determine the actual stresses when the section is subjected to the limiting moment of resistance. [8M]

2. (a) Write short notes about the development length. [4M]
 (b) A simply supported beam, 300 mm wide and 600 mm effective depth carries a uniformly distributed load of 74 kN/m including its own weight over an effective span of 6 m. The reinforcement consists of 5 bars of 25 mm diameter. Out of these, two bars can be safely bent up at 1 m distance from the support. Design the shear reinforcement for the beam. [10M]
 Given data: Grade of concrete: M 20
 Grade of steel: Fe 415
 Assume width of support = 400 mm

UNIT – II

3. (a) Write short notes about the upper bound and lower bound theorems. [6M]
 (b) Design a continuous reinforced concrete beam of rectangular section to support a dead load 10 kN/m and live load of 12 kN/m over 3 spans of 6 m each. The ends are simply supported. Adopt M -20 grade and concrete Fe-415 HYSD bars. Sketch the details of reinforcements in the beam. [8M]

4. (a) Write the assumptions and characteristic features of yield lines for analysis of slabs. [6M]
 (b) Design a circular slab of diameter 5 m which is simply supported at the edges. Live load = 4 kN/m². Assume M-20 grade concrete and Fe-415 HYSD bars. Assume load factors according to IS:456-2000. [8M]

UNIT – III

5. (a) Write different types of flat slabs with diagrammatically representation. [6M]
(b) Design the interior panel of a flat slab for a ware house to suit the following data: [8M]
Given Data: size of ware house 24 m by 24 m divided into panels of 6 m by 6 m
Live load -5 kN/m^2
Materials: M-20 Grade concrete
Fe-415 grade HYSD bars.
6. (a) Write the guidelines for proportioning [6M]
i. Drops
ii. Column heads
iii. Thickness of flat slab
(b) Design an interior panel of a flat slab of size $5 \text{ m} \times 5 \text{ m}$ without providing drop and column head. Size of columns is $500 \times 500 \text{ mm}$ and live load on the panel is 4 kN/m^2 take floor finishing load as 1 kN/m^2 . Use M20 concrete and Fe 415 steel. [8M]

UNIT – IV

7. (a) Discuss the steps for designing of deep beams. [6M]
(b) A reinforced concrete deep girder is continuous over spans of 9 m apart from center to center it is 4.5 m deep, 300 mm thick, and the supports columns 900 mm in width. If girder supports a uniformly distributed load of 200 kN/m including its own weight, design the necessary steel assuming M 20 concrete and Fe 415 steel. [8M]
8. (a) Discuss stepwise procedure as recommended for the design of corbels. [6M]
(b) Design a corbel to support a factored load of 400 kN at a distance of 200 mm from the face of a column 300 mm by 400 mm. Adopt M-25 grade concrete and Fe-415 grade HYSD bars. Sketch the details of reinforced in the corbel. [8M]

UNIT – V

9. (a) Give the details of Indian standard code requirements of slenderness components like short and axially loaded tied column. [6M]
(b) Design the reinforcements in a column size 400 mm by 600 mm subjected to an axial working load of 2000 kN. The column has an unsupported length of 3 m and is braced against side sway in both directions. Adopt M-20 grade concrete and Fe-415 HYSD. bars. [8M]
10. (a) Write short notes, on the following and also represent them using diagrams: [6M]
i. Isolated column footing
ii. Combined footing
(b) A reinforced concrete column 400 mm by 400 mm supports an axial service load of 100 kN the safe bearing capacity of the soil at site is 200 kN/m^2 . Adopting M-20 grade concrete and Fe-415 HYSD bars design a suitable footing for the column and sketch the details of reinforcement. [8M]



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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

COMPUTER ORIENTED NUMERICAL METHODS

(Structural Engineering)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) Solve the following system of equations using Gaussian Elimination method. [7M]
 $x+y+z=9, 2x-3y+4z=13, 3x+4y+5z=40$
- (b) Solve the following equations using Jacobi's iteration method up to third iteration. [7M]
 $3x+4y+15z=54.8, x+12y+3z=39.66, 10x+y-2z=7.74$
2. (a) Solve the following equation Using relaxation method. [7M]
 $5x-y-3=3, -x+10y-2z=17, -x-y+10z=8$
- (b) Determine the largest Eigen value and the corresponding Eigen vector of the matrix. [7M]

$$\begin{pmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{pmatrix}$$

UNIT – II

3. (a) Prove that if $g(x)$ is a continuous function on some interval $[a, b]$ and differentiable on (a, b) and if $g(a)=0, g(b)=0$, then there is a least point ζ inside (a, b) for which $g'(\zeta)=0$. [7M]
- (b) Determine the step size h that can be used in the tabulation of $f(x)=\sin x$ in the interval $[1,3]$ so that linear interpolation will be correct to 4-decimal places after rounding. [7M]
4. (a) Construct the divided difference table for the data given in table 1. [7M]

Table 1

x	0.5	1.5	3.0	5.0	6.5	8.0
f(x)	1.625	5.875	31.0	131.0	282.125	521.0

Hence find the interpolating polynomial and an approximation to the value of $f(7)$.

- (b) Given the set of data points $(1,-8), (2,-8) \& (3,18)$ satisfying the function $y=f(x)$, find splines satisfying the given data. Find the approximate value of $y(2.5), y'(2.0)$.

UNIT – III

5. (a) Fit a second degree Parabola [7M]
 $Y = a_0 + a_1x + a_2x^2$ to the data $(x : y) : (1, 0.63), (3, 2.05), (4, 4.08), (6, 10.78)$.
- (b) For linear interpolation, in the case of equispaced tabular data, show that the error does not exceed $1/8$ of 2^{nd} difference. [7M]
6. (a) Obtain the rational approximation of the form $\frac{a_0 + a_1x}{1 + b_1x}$ to e^x . [7M]
- (b) Find the value of y from the following data given in table 2 at $x = 2.65$. [7M]

Table 2

x	-1	0	1	2	3
y	-21	6	15	12	3

UNIT – IV

7. (a) Given $u_0 = 5, u_1 = 15, u_2 = 57$ and $du/dx = 4$ at $x = 0$ and 72 at $x = 2$. Find the $\Delta^3 u_0$ and $\Delta^4 u_0$. [7M]
- (b) The population of a certain town is shown in the following table 3 [7M]

Table 3

Year x	1931	1941	1951	1961	1971
Year y	40.62	60.80	79.65	103.56	132.65

Find the rate of the population in 1961.

8. (a) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule with $h = 0.2$. Hence determine the value of π . [7M]
- (b) Calculate $\int e^{-x} x^{\frac{1}{2}} dx$ taking 5 ordinates by Simpson's $1/3$ rule. [7M]

UNIT – V

9. (a) Given the differential equation $y'' - xy' - y = 0$ with condition $y(0) = 1$ and $y'(0) = 0$. Find the value of $y(0.1)$ using Taylor's series method, [6M]
- (b) Solve the boundary value problem with $y(0) = 0$ and $y(2) = 3.62686$ where $\frac{d^2y}{dx^2} - y = 0$. [8M]
10. (a) Consider a boundary-value problem is defined by $y'' + y + 1 = 0, 0 \leq x \leq 1$. Where $h = 0.5$ use finite difference method to determine the value of $y(0.5)$. [7M]
- (b) Given the boundary value problem $x^2 y'' + xy' + y = 0, y(1) = 1, y(2) = 0.5$, apply the cubic spline method to determine the value of $y(1)$. [7M]



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Question Paper Code: BST201



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

MATRIX METHODS OF STRUCTURAL ANALYSIS

(Structural Engineering)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- (a) Derive load vector and displacement matrix for simply supported beam subjected to w kN/m uniformly distributed load long entire span of L . [7M]
(b) Explain local and global stiffness matrix for a simple truss member with example. [7M]
- (a) Determine the degrees of statical and kinematic indeterminacy of the beam ABC shown in Figure 1. [7M]

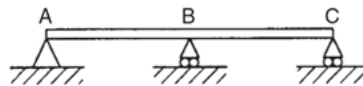


Figure 1

- (b) Determine the degrees of statical and kinematic indeterminacy of the beam ABC shown in Figure 2. [7M]

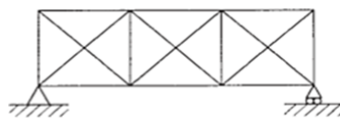


Figure 2

UNIT – II

- (a) Analyze the axially loaded structure as shown in Figure 3. [7M]

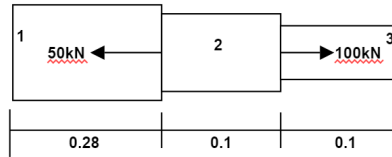


Figure 3

The individual member properties are:

[7M]

Member	Length (m)	Area (mm^2)	Material, E (kN/mm^2)
1	0.28	400	70
2	0.1	200	100
3	0.1	70	200

Find the displacement of the connections and the forces in each member.

- (b) Determine the force vector and displacement matrix for the following truss shown in Figure 4, $E = 200 \text{ kN}/\text{mm}^2$, The reference area is $A = 100 \text{ mm}^2$. [7M]

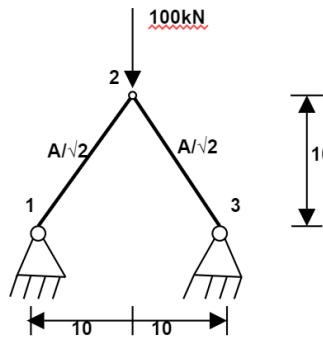


Figure 4

4. (a) Determine the force vector and displacement matrix for the following $E = 200 \text{ kN}/\text{mm}^2$ area is $A = 100 \text{ mm}^2$. [7M]

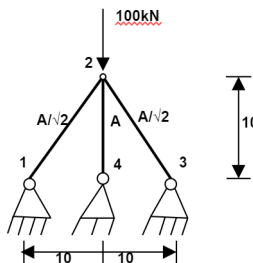


Figure 5

- (b) For the following frame shown in Figure 6, determine the rotation of the joints and the bending moment diagram. Neglect axial deformation. Take $EI = 1 \times 10^5 kN - m^2$. [7M]

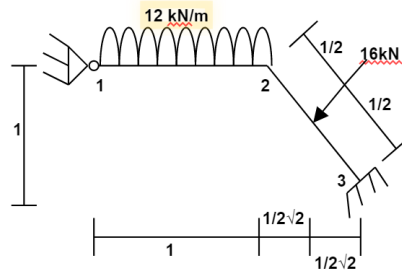


Figure 6

UNIT – III

5. Analyze the continuous beam shown Figure 7. Assume that the supports are unyielding. Assume that EI is constant for all members, using Flexibility Method. [14M]

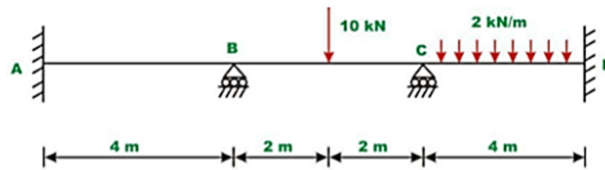


Figure 7

6. A truss of span 7.5 m carries a point load of 1 kN at joint D as shown in Figure 8 find the reactions and forces in the members of the truss, using Flexibility Method. [14M]

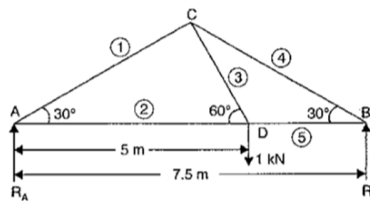


Figure 8

UNIT – IV

7. Analyze the plane frame shown in Figure 9 by direct stiffness method. Assume that the flexural rigidity for all members is the same. Neglect axial displacements. [14M]

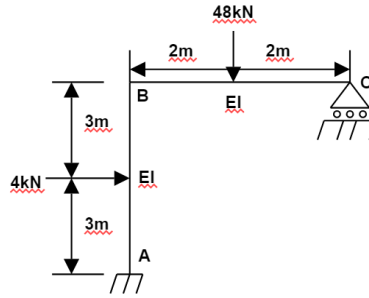


Figure 9

8. Analyze the continuous beam shown in Figure 10 assume that the supports are unyielding. Assume EI to be constant for all members using direct stiffness method. [14M]

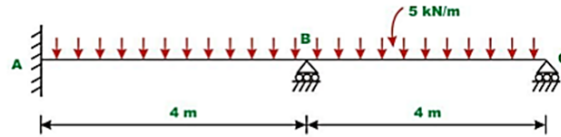


Figure 10

UNIT – V

9. (a) Write a short notes on following: [10M]
 i. Static condensation of stiffness matrix
 ii. Sub structuring of stiffness matrix
 (b) Summarize how stiffness matrix is also called as equilibrium method. [4M]
10. Analyze the truss given in Figure 11, member 13 is subject to a temperature change of $100^{\circ}C$. Where $EA = 2 \times 10^4$ kN, the area of member 12 as $2A$, the area of member 13 as A , and the area of member 14 as $A\sqrt{2}$. [14M]

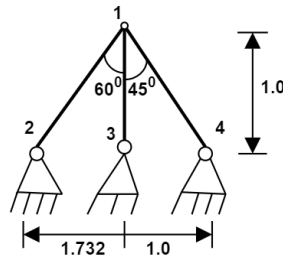


Figure 11



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Question Paper Code: BST205



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

ADVANCED CONCRETE TECHNOLOGY

(Structural Engineering)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- (a) What is meant by hydration of cement? Explain the hydration reaction of important Bogue's compounds indicating the products of hydration. [7M]

(b) Explain how you determine the strength of aggregate using aggregate crushing and impact value tests? [7M]
- (a) Explain in detail with sketches the structure of hydrated cement paste? [7M]

(b) What are Super plasticizers? Discuss the classification of Super plasticizers? What are the effects of Super plasticizers on Fresh Concrete? [7M]

UNIT – II

- (a) What are the causes of Bleeding and Segregation? Discuss the method of test for Bleeding of concrete? [7M]

(b) List the techniques for measuring Pulse velocity through concrete? Explain briefly the factors affecting the measurement of Pulse Velocity? [7M]
- (a) Explain briefly the various factors which affect the workability of concrete? [7M]

(b) Discuss maturity of concrete? How is it measured? What are its practical uses in the concrete industry? [7M]

UNIT – III

- (a) Explain how High-Strength concrete can be classified? What are the various techniques used to achieve high strength? [7M]

(b) What are the factors which control the performance of High Performance concrete? [7M]
- (a) What are the advantages and applications of using High-Strength concrete? [7M]

(b) What are the requirements for High-performance characteristics? Explain briefly the methods for achieving High-performance? [7M]

UNIT – IV

7. (a) Explain briefly the requirements for self-compacting concrete. Explain production and placing of self-compacting concrete. [6M]
- (b) What are the different types of fibers used in concrete? What are the factors effecting properties of fiber reinforced concrete? [8M]
8. (a) Explain the properties and applications of polymer impregnated concrete. [7M]
- (b) Explain in detail the method of design of light weight aggregate concrete mix. [7M]

UNIT – V

9. (a) List the various methods used for proportioning concrete mixes. Write any one procedure for determining concrete mix design. [7M]
- (b) Discuss the tests necessary to check the adoptability of a particular mix proportion for field use. [7M]
10. (a) What are the variables to be considered in proportioning of concrete mixes? Write a note on statistical quality control of concrete. [7M]
- (b) Design the concrete mix for M45 grade of concrete with the following data: [7M]
- Type of cement: OPC 43 grade
Maximum size of aggregate: 20 mm
Exposure condition: Severe (RCC)
Workability: 125 mm slump
Minimum cement content: 320 kg/m³
Maximum water cement ratio: 0.45
Method of placing concrete: pumping
Degree of supervision: good
Type of aggregate: Crushed angular aggregate
Super plasticizer will be used
Sp. Gr of CA: 2.80
Sp. Gr of FA: 2.70
Water absorption of CA: 0.5%
Water absorption of FA: 1%
Free surface moisture of CA: Nil
Free surface moisture of FA: Nil
Grading of CA conforming to Table 2 of IS 383
Grading of CA conforming to grading Zone 2.

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Hall Ticket No

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Question Paper Code: BAE701



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE-R16

INTRODUCTION TO AEROSPACE ENGINEERING

(Power Electronics and Electrical Drives)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) Discuss the Historical perspective of aeronautics. [6M]
(b) A wind tunnel located at a pressure altitude of 500m ($\rho = 1.16 \text{Kg/m}^3$, $P=95472 \text{N/m}^2$) has a circular section of 5m. Air travels at 100m/s inside test section, speed of air in larger diameter is 20m/s. Determine upstream diameter, upstream pressure and mercury column height. [8M]
2. (a) Discuss the parameters affecting aerodynamic forces. [7M]
(b) Define Mach number? Derive an expression for speed of sound. [7M]

UNIT – II

3. (a) Using Helmholtz vortex theorem, derive an expression for induced drag coefficient for elliptical lift distribution. [8M]
(b) Write short notes on the following. [6M]
 - i. wing vortices
 - ii. Downwash
4. (a) Briefly explain variation of lift and drag coefficient with respect to angle attack. [6M]
(b) Explain the principle of lift theory. Discuss the effect of sweep back on maximum lift. [8M]

UNIT – III

5. (a) Discuss the formation of boundary layer over bluff bodies. [7M]
(b) Discuss in detail about Deep stall and Pitching moments. [7M]
6. (a) Explain in detail about [7M]
 - i. laminar flow
 - ii. Turbulent flow
 - iii. Laminar sub layer
(b) Discuss the influence of mach number on drag coefficient. [7M]

UNIT – IV

7. (a) Explain longitudinal stability of aircraft in detail . [7M]
(b) Explain gliding & turning of aircraft. [7M]
8. (a) With the help of P-v and T-s diagram, explain the working of closed cycle gas turbine. [7M]
(b) Explain dutch roll with the help of neat sketch . [7M]

UNIT – V

9. (a) Discuss the development of aircraft structures. [7M]
(b) Briefly discuss the effect of temperature in hypersonic flow. [7M]
10. Explain in brief about [14M]
i. orbital maneuvers
ii. Rocket trajectories
iii. ballistic entry

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