

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)

Sub_Code: MEPC3004

6th Semester Regular Examination: 2025-26

SUBJECT: IC Engines & Gas Turbines

BRANCH(S): MECH, ME

Time: 3 Hours

Max Marks: 100

Q.Code: V102

Answer Q1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1

Answer the following questions:

(2 x 10)

- Define the term compression ratio.
- Discuss indicated thermal efficiency and brake thermal efficiency.
- Mention the various assumption made in air-standard cycle analysis.
- What is the difference between air-standard and fuel air-cycles?
- What is delay period?
- Define the term carburetion.
- Why cooling of an internal combustion engine is necessary?
- Draw the P-V and T-S diagram of a simple Brayton cycle.
- Write steady flow energy equation for nozzle.
- Write the difference between the impulse and reaction turbine.

Part-II

Q2

Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)

(6 x 8)

- A four-stroke petrol engine delivers a brake power of 36.8 kW with a mechanical efficiency of 80 %. The air-fuel ratio is 15:1 and the fuel consumption are 0.4068 kg/kWh. The heating value of the fuel is 42000 kJ/kg. Calculate (i) indicated power, (ii) frictional power, (iii) brake thermal efficiency, (iv) indicated thermal efficiency, (v) total fuel consumption, (vi) air consumption/second.
- Draw the P-V and T-S diagram for Otto and Diesel cycle. Derive the expression for the efficiency and mean effective pressure of the Otto cycle.
- The mean effective pressure of an ideal Diesel cycle is 8 bar. If the initial pressure is 1.03 bar and the compression ratio is 12, determine the cut-off ratio and the air-standard efficiency. Assume ratio of specific heats for air to be 1.4.
- An Otto cycle engine having a clearance volume of 250 cc has a compression ratio of 8. The ratio of pressure rise at constant volume is 4. If the initial pressure is 1 bar, find the work done per cycle and the theoretical mean effective pressure. Take $\gamma = 1.4$.

- e) Explain the effect of various engine variables on SI engine knock.
- f) What is ignition lag? Discuss the effect of engine variables on ignition lag.
- g) Discuss the various factors affecting the delay period.
- h) Explain the various factors that affect the process of carburetion.
- i) Discuss the functional requirements of an injection system.
- j) Make a comparison between air injection system and solid injection system.
- k) A gas turbine unit works on an air-standard Brayton cycle. The pressure ratio across the compression is 6. Air enters the compressor at 1 bar and 27 °C. The maximum temperature of the cycle is 850 °C. Calculate the power developed by the unit for a mass flow rate of 10 kg/s.
- l) Describe the pressure compounded impulse turbine.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Bring out clearly the process of combustion in CI engines and also explain the various stages of combustion. (16)
- Q4** Discuss the effect of the following engine variables on flame propagation: (16)
(a) Fuel-air ratio (b) Compression ratio (c) Engine load (d) Turbulence (e) Engine speed
- Q5** Describe with sketches the following methods for exhaust emission control (16)
(a) Catalytic Converter system
(b) Exhaust gas recirculation device
- Q6** An open cycle gas turbine plant has a single compressor and a single stage expander incorporating a heat exchanger. The air suction temperature is 17 °C and the pressure 1 bar. For an overall pressure ratio of 4.5 and shaft output of 4000 kW, the mass flow is 40 kg/s. If the thermal ratio of the heat exchanger 0.6 and the isentropic efficiency of compressor is 0.84, calculate the isentropic efficiency of the gas turbine for a plant thermal efficiency of 0.29. Take for air: $\gamma = 1.4$, $C_{pa} = 1.005 \text{ kJ/kg K}$, For gas: $\gamma = 1.365$, $C_{pg} = 1.07 \text{ kJ/kg-K}$ (16)

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)

Sub_Code: CIPE3004

6th Semester Regular Examination: 2025-26
SUBJECT: Advanced Transportation Engineering
BRANCH(S): CIVIL
Time: 3 Hours
Max Marks: 100
Q.Code: V192

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- a) Define "Hauling capacity of a locomotive".
- b) Differentiate between can't deficiency and can't excess.
- c) The sleeper density for a B.G. track is $(N+6)$. Find numbers of sleepers required for 1 km of track length?
- d) What are the possible causes of creep?
- e) What is the function of check rail and wing rail?
- f) A ruling gradient of 0.5 % is to be provided for a B.G. track having a horizontal curve of 4° . Determine the value of grade compensation.
- g) What is the necessity of providing Bearing plate?
- h) Define Zoning laws.
- i) What is the function of holding aprons?
- j) Why Breakwater is provided?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- a) Discuss the factors affecting the adoption of a particular gauge.
- b) Calculate Maximum permissible train load that can be pulled by a locomotive having 4 pairs of driving wheels carrying an axle load of 22 tonnes each. The train has to run at a speed of 90 kmph on a straight level B.G. track. Also calculate the reduction in speed, if train has to climb a gradient of 1 in 150.
- c) What are the requirements of good ballast used in Indian railway?
- d) What are the different types of surveys to be carried out for taking up new railway project?
- e) A 5° curve diverges from a 3° main curve in reverse direction in the layout of B.G. yard. If the speed on branch line is restricted to 50 kmph, determine the restricted speed on the main line.
- f) Explain the principles of interlocking.
- g) What are the methods to reduce the wear of rail?

- h) Explain the working principle of semaphore signal.
- i) What is the geometric standard of taxiway?
- j) The length of runway under standard conditions is 2250 m. The Airport site has an elevation of 380 m. Its reference temperature is 34 °c. if the runway is to be constructed with an effective gradient of 0.2 percent. Determine the corrected runway length as per ICAO and FAA.
- k) What are the characteristics of Mound Breakwater?
- l) Write short note on Jetty.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Briefly explain the different types of rail joints used in Indian railway. (16)
- Q4** Derive an expression for finding Superelevation at the horizontal curve of a Railway track. (16)
- Q5** Briefly explain the type-I and type-II wind rose diagram. (16)
- Q6** What are the factors affecting the site selection of harbour? Discuss the fixed and floating type of signals. (16)

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Course: B.Tech/IDD (B.Tech & M.Tech)
Sub_Code: MEPE3014

6th Semester Regular Examination: 2025-26

SUBJECT: Automobile Engineering

BRANCH(S): MECH, MMEAM

Time: 3 Hours

Max Marks: 100

Q.Code: V193

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- a) What are the different chassis configurations used in automobiles?
- b) What forces act on a car in motion?
- c) What is firing order?
- d) How hydraulic brakes work?
- e) What is overdrive and how is it achieved?
- f) Differentiate between semi and fully automatic transmission.
- g) What is the principle of correct steering?
- h) Which steering mechanism is generally used in passenger cars?
- i) How does the electrical charging system work?
- j) Why solar power vehicles are preferred?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- a) Show with neat sketches how cylinder numbers and orientation effects balancing on engine.
- b) Write about selection of braking system for a car.
- c) Differentiate between working of drum and disc brakes.
- d) Explain the Hotchkiss drives.
- e) Differentiate between a two wheel and a four-wheel drive with neat diagram.
- f) Explain working of torque converter.
- g) Explain working of differential with a neat sketch.
- h) Draw front wheel geometry of the steering system and explain Camber, castor, and kingpin inclination.
- i) Explain different battery types used in EV.

- j) Differentiate between series and parallel hybrid vehicles.
- k) Explain working of fuel cells vehicles.
- l) Write about troubleshooting of engine systems.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- | | | |
|-----------|--|-------------|
| Q3 | Explain with a neat sketch the working of the electrical system of a hybrid electric vehicle (HEV). | (16) |
| Q4 | Draw the Layout of an all-wheel drive transmission system and explain the main function of the different components of the transmission system. | (16) |
| Q5 | Explain with a neat diagram steering condition for true rolling and explain Ackerman steering geometry working, also find out minimum steering radius. | (16) |
| Q6 | Compare, with neat diagrams working and selection consideration of engine power train sizing for SUV. | (16) |

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Course: B.Tech/IDD (B.Tech & M.Tech)
Sub Code: HSHS3001

6th Semester Regular Examination: 2025-26

SUBJECT: BUSINESS MANAGEMENT

BRANCH(S): AE, AERO, AME, AUTO, BIOMED, BIOTECH, CE, C&EE, CHEM, CIVIL,
ELECTRICAL & C.E, MECH, ME, METTA, MINERAL, MINING, MME, MMEAM, PT

Time: 3 Hour

Max Marks: 100

Q. Code: V042

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- What is the full form of SBU?
- What is project life cycle? Explain its phases.
- What is Laissez-Faire leadership?
- What is crowdfunding in project management?
- What is work breakdown structure?
- What is cultural diversity?
- Explain Maslow's hierarchy of needs.
- What is transformational leadership?
- What is meant by managerial effectiveness?
- What is extrinsic motivation?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Why is teamwork important in engineering projects?
- How can managers balance intrinsic and extrinsic motivation?
- What is social-cost-benefit analysis? Explain in detail.
- 'An engineering firm wants to improve innovation'- Explain.
- Discuss the importance of balance sheet, profit, and loss account.
- Explain cost control techniques in engineering projects.
- What do you mean by team building? Explain its importance.
- Discuss the various factors affecting group behaviour in organization.
- Explain the process of budgeting in engineering projects.
- Discuss the barriers to communication and suggest the remedies.
- Explain the concept of time value of money with suitable examples.
- Discuss the concept of delegation and its importance.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Explain the various funding sources available in engineering projects. Explain the advantages and limitations. **(16)**
- Q4** Explain the various challenges faced by the managers in global and multicultural engineering environment. **(16)**
- Q5** Explain the concept of management. Discuss the five major functions of management with suitable examples from engineering organizations. **(16)**
- Q6** Discuss the principles of Total Quality Management and explain their applications in engineering projects in India. **(16)**

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Course: B.Tech/IDD (B.Tech & M.Tech)
Sub_Code: CSPC3004

6th Semester Regular Examination: 2025-26
SUBJECT: Compiler Design
BRANCH(S): CE, CSE, CSEAI, CSEAIML, CSIT, CST, IT
Time: 3 Hours
Max Marks: 100
Q.Code: V092

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions:

(2 x 10)

- Briefly distinguish between a compiler and an interpreter within a language processing system.
- Explain the role of input buffering in the context of a lexical analyzer.
- Define "left recursion" in a grammar. Why must it be eliminated before recursive descent parsing?
- What is the "dangling else" problem, and how do parsers typically resolve it?
- Distinguish between S-attributed and L-attributed definitions in semantic analysis.
- Define a "quadruple" used for intermediate code generation and provide its generic structure.
- State the primary purpose of an activation record during runtime.
- List the fundamental operations performed on a symbol table.
- What is "constant folding" in machine-independent code optimization? Provide a one-line example.
- Briefly explain the objective of peephole optimization.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)

(6 x 8)

- Analyze the different phases of a compiler. Illustrate the transformation of the assignment statement $val = initial + rate * 50$ through each phase up to intermediate code generation.
- Construct an NFA for the regular expression $(a|b)^*abb$ using Thompson's construction. Subsequently, apply the subset construction algorithm to convert this NFA into an equivalent DFA.
- Explain the mechanism of Shift-reduce parsing. Specifically, define "handles" and "handle pruning" with a suitable derivation example.
- Compare and contrast SLR, CLR, and LALR parsing tables. Discuss their relative power, number of states, and typical parser conflicts.
- Design an Abstract Syntax Tree (AST) and generate the corresponding three-address code for the arithmetic expression $-(a * b) + (c + d) - (a * b)$.
- What is backpatching? Explain its significance in the translation of Boolean expressions and control-flow statements.
- Discuss the various parameter passing mechanisms utilized in a runtime environment, highlighting how access to non-local data is managed.
- Outline the classification of errors encountered in different compiler phases. What are the common error recovery strategies implemented in parsing?

- i) Analyze the difference between Common Subexpression Elimination and Dead Code Elimination. Provide code snippets to demonstrate how each machine-independent optimization technique improves code.
- j) Construct a Directed Acyclic Graph (DAG) for the block of three-address code below. How does the DAG aid in basic block optimization?
 - i. $t_1 = b + c$
 - ii. $t_2 = d * e$
 - iii. $t_3 = b + c$
 - iv. $a = t_1 - t_2$
 - v. $f = a + t_3$
- k) Explain the functional relationship between a Lexical Analyzer Generator (LEX) and a Parser Generator (YACC). How do they communicate to process a source program?
- l) Describe the concept of Garbage collection using reference counting in the context of memory management. What are its limitations?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Consider the following context-free grammar: (16)
- $S \rightarrow L = R \mid R$
 $L \rightarrow * R \mid id$
 $R \rightarrow L$
- (a) Compute the canonical collection of LR (0) items for this grammar.
 - (b) Construct the SLR parsing table.
 - (c) Trace the shift-reduce actions of your parser for the input string `*id = id`. Identify if any shift/reduce conflicts arise.
- Q4** a) Formulate a Syntax-Directed Translation Scheme (SDTS) to act as a desk calculator that evaluates arithmetic expressions containing addition, multiplication, and parentheses. (8 x 2)
- b) Given the code construct:
- ```
switch (expr)
{case 1: stmt1; case 2: stmt2; default: stmt3;}
```
- Write the semantic rules to generate intermediate three-address code for this case statement utilizing jump instructions and backpatching.
- Q5** A robust compiler must effectively manage the runtime environment. (16)
- (a) Evaluate the differences between stack allocation and heap management for storage organization.
  - (b) Design the structure of an Activation Record. Explain the role of each field (such as return value, control link, access link, and saved machine status) during a recursive procedure call.
  - (c) Discuss how the symbol table handles scope management for nested procedures, including the insert and lookup operations.
- Q6** Code generation and optimization bridge intermediate code to the target machine model. (16)
- (a) Identify and explain the primary issues in the design of a code generator.
  - (b) Apply loop optimization techniques (such as code motion and strength reduction) to optimize the following for loop:
 

```
for (int i = 0; i < 100; i++) {a[i] = x * y + i * 4;}
```
  - (c) Discuss the role of register allocation and instruction scheduling in machine-dependent optimization.

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Total Number of Pages: 03

Course: B.Tech/IDD (B.Tech & M.Tech)  
Sub\_Code: CIPE3006

6<sup>th</sup> Semester Regular Examination: 2025-26  
Construction Management and Professional Practice  
BRANCH: CIVIL  
Time: 3 Hours  
Max Marks: 100  
Q.Code: V247

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.  
The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions:

(2 x 10)

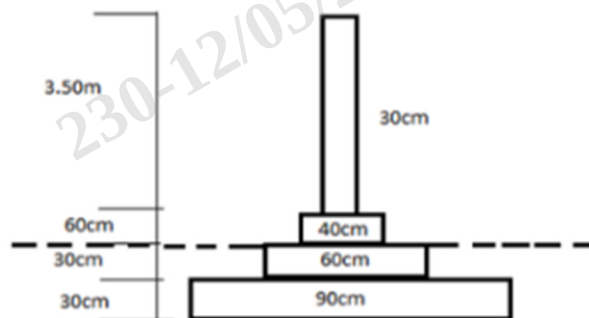
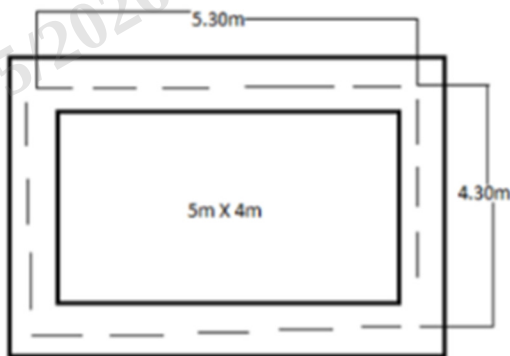
- What is plinth area estimate?
- What are the unit of measurement of DPC and One brick thick Brick wall in super structure?
- What are the basic data to be known before analysing the rate of a particular item?
- How are general specifications different from detailed specifications?
- Write the difference between earnest money deposit and security money deposit.
- What is meant by dummy activity?
- Define EST, EFT, LST, and LFT.
- Write the difference between PERT and CPM
- Write the difference between R chart and C chart
- What is meant by indirect and direct cost?

Part-II

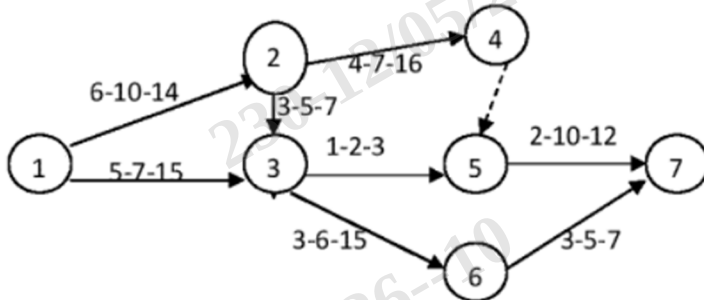
Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)

(6 x 8)

- Describe the types of estimates.
- Summarize the general rules of Measurement and also explain the deductions and additions to be applied in the case of estimation of plastering.
- A single room building is shown in figure. Calculate the quantities of Earth work excavation in foundation using (i) Long Wall-Sort wall method and (ii) Center line method.



- d) Prepare the analysis of rate for cement concrete in proportion (1:2:4).
- e) Write down the general specifications of first class of Building.
- f) Explain the contents of a typical tender notice.
- g) What do you mean by critical path? How is it determined? Give its significance.
- h) The PERT network of certain project is shown in Fig. Find the critical path.

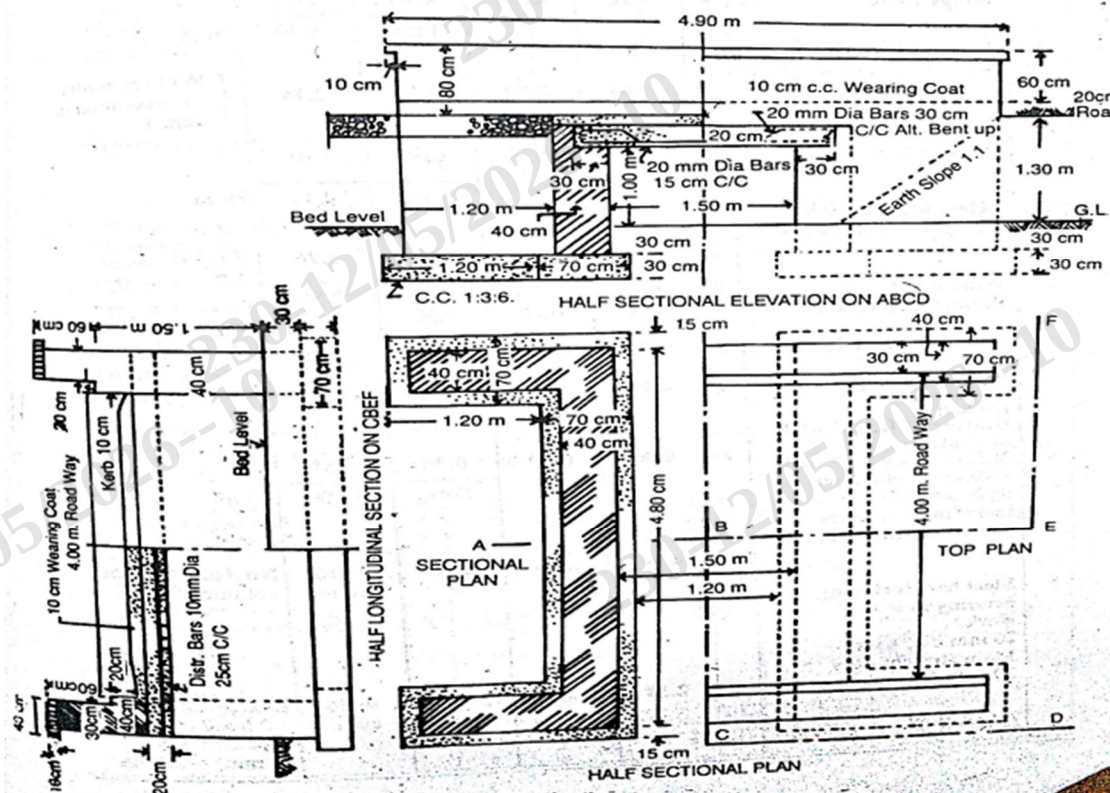


- i) Define different type of float and derive the relationship among them.
- j) Explain the components of project cost.
- k) Explain resource smoothing and resource levelling.
- l) Write notes on construction safety practices and their importance in project management.

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Prepare an estimate for the slab culvert shown in figure. Assume suitable rate and suitable data if necessary **(16)**



**Q4** Describe the detailed specification of the following items of works (16)  
(i) RCC 1:1 ½ : 3  
(ii) Color washing  
(iii) I Class Brick work in super structure using CM 1:5  
(iv) Plastering using cement Mortar 1:5

**Q5** The duration of activities of a project is as follows. Draw the PERT network diagram. Identify (16)  
various paths. Identify the critical path. Tabulate the computations. Evaluate the project time.

| Activity         | 1-2 | 1-3 | 2-4 | 2-5 | 4-7 | 5-7 | 7-8 | 3-6 | 6-8 |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Duration in days | 5   | 10  | 1   | 6   | 12  | 3   | 4   | 7   | 6   |

**Q6** Discuss in detail statistical quality control methods used in construction. (16)

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Course: B.Tech/IDD (B.Tech & M.Tech)

Sub\_Code: CSPE3009

6<sup>th</sup> Semester Regular Examination: 2025-26  
SUBJECT: Data Mining and Data Warehousing  
BRANCH(S): CE, CSE, CSIT, CST, IT  
Time: 3 Hours  
Max Marks: 100  
Q.Code: V249

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.  
The figures in the right-hand margin indicate marks.

**Part-I**

**Q1 Answer the following questions: (2 x 10)**

- a) Explain the process of KDD.
- b) Explain Evolution and deviation analysis.
- c) What is Data Purging?
- d) Differentiate between Discovery versus Prediction.
- e) How Backpropagation Network Works?
- f) What Are Cubes?
- g) What is the use of Cleanup & transformation Tools?
- h) Write short notes on Algorithm Score card.
- i) Difference between Nearest Neighbor and Clustering.
- j) Explain how Clustering is used for out layer analysis.

**Part-II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)**

- a) What is a multidimensional data model? How is it used in a data warehouse?
- b) Why Fuzzy logic is an important area for Data Mining?
- c) Define outlier. State at least two applications of outlier mining.
- d) Given two objects represented by the tuples (22, 1, 42, 10) and (20, 0, 36, 8). Compute the Euclidian and Manhattan distance between the two objects.
- e) List two advantages of feature reduction. How dimensionality reduction is achieved using Principal Component Analysis (PCA)?
- f) Define the difference between Shared Memory Architecture and Shared Disk Architecture.
- g) Explain the Decision Tree Classifier.
- h) Explain how to map the Data Warehouse to Multi Processor Architecture.
- i) Define the difference, Business & Data Warehouse.
- j) Explain with example, Parallel Processors, and Cluster Systems.
- k) What do you mean by Distributed Memory Architecture? Explain briefly.
- l) Write short notes on (i) Decision Tree (ii) Growing the Tree.

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Explain the ETL cycles' three-layer architecture and explain how ETL Process works in Data Warehouse, with example. (16)
- Q4** Discuss *k*-Means and *k*-Medioids algorithm. Illustrate the strength and weakness of *k*-Means in comparison with the *k*-Medioids algorithm. (16)
- Q5** Explain the major ideas of naïve Bayesian classification. For the day <sunny, cool, high, strong>, what's the play prediction? (16)

| Day   | Outlook  | Temp | Humidity | Wind   | Play Tennis |
|-------|----------|------|----------|--------|-------------|
| Day1  | Sunny    | Hot  | High     | Weak   | No          |
| Day2  | Sunny    | Hot  | High     | Strong | No          |
| Day3  | Overcast | Hot  | High     | Weak   | Yes         |
| Day4  | Rain     | Mild | High     | Weak   | Yes         |
| Day5  | Rain     | Cool | Normal   | Weak   | Yes         |
| Day6  | Rain     | Cool | Normal   | Strong | No          |
| Day7  | Overcast | Cool | Normal   | Strong | Yes         |
| Day8  | Sunny    | Mild | High     | Weak   | No          |
| Day9  | Sunny    | Cool | Normal   | Weak   | Yes         |
| Day10 | Rain     | Mild | Normal   | Weak   | Yes         |
| Day11 | Sunny    | Mild | Normal   | Strong | Yes         |
| Day12 | Overcast | Mild | High     | Strong | Yes         |
| Day13 | Overcast | Hot  | Normal   | Weak   | Yes         |
| Day14 | Rain     | Mild | High     | Strong | No          |

- Q6** How can we find frequent item sets using candidate generation? Discuss the Apriori algorithm with example. How can we further improve the efficiency of Apriori based mining? Justify your answer with respect to hash- based technique and vertical data format. There are 4 transactions in the database given below. Illustrate the Apriori algorithm to find the frequent item sets from the given database. Given the minimum support threshold is 50 %. (16)

| Transaction ID | Items Bought         |
|----------------|----------------------|
| 1              | Shoes, Shirt, Jacket |
| 2              | Shoes,Jacket         |
| 3              | Shoes, Jeans         |
| 4              | Shirt, Sweatshirt    |

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Course: B.Tech  
Sub\_Code: AIPC3005

6<sup>th</sup> Semester Regular Examination: 2025-26

SUBJECT: Deep Learning

BRANCH(S): CSE, CSEAI, CSEAIML, CSEDS, ELECTRICAL & C.E, IT

Time: 3 Hours

Max Marks: 100

Q.Code: V199

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.

The figures in the right-hand margin indicate marks.

**Part-I**

**Q1 Answer the following questions: (2 x 10)**

- a) Differentiate between machine learning and deep learning.
- b) Compare biological neurons and artificial neurons with respect to signal processing.
- c) List common hyperparameters in deep learning models.
- d) Compare L1 and L2 regularization.
- e) State the purpose of dropout in neural networks.
- f) Differentiate between LeNet and AlexNet architectures.
- g) State the purpose of transfer learning in CNNs.
- h) List the applications of Vision Transformers.
- i) State the purpose of encoder-decoder architectures.
- j) Distinguish between basic and denoising autoencoders.

**Part-II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)**

- a) Analyze how loss functions influence learning in regression vs. classification tasks.
- b) Evaluate the impact of poor initialization on convergence and performance.
- c) Show the role of regularization techniques in improving generalization.
- d) Examine hyperparameter tuning strategies for deep networks.
- e) Analyze the impact of learning rate on convergence speed and stability.
- f) Compare semantic segmentation models like FCN and U-Net.
- g) Analyze the role of pooling layers in reducing spatial dimensions.
- h) Show scaled dot-product attention with an example.
- i) Compare BERT and GPT models in NLP applications.
- j) Design a transformer-based solution for an NLP or time-series problem.
- k) Discuss ethical considerations in deep learning, including bias and responsible AI.
- l) Analyze GAN training process, challenges, and improvements.

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Describe the architecture and functioning of feedforward neural networks, including activation functions and loss computation. **(16)**
- Q4** Compare optimization algorithms (SGD, Adam, RMSProp) with mathematical intuition and practical implications. **(16)**
- Q5** Describe CNN architecture, including convolution, pooling, and fully connected layers, with examples. **(16)**
- Q6** Describe sequence modeling techniques, including RNN, LSTM, and GRU, with their limitations. **(16)**

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)  
Sub\_Code: CIPC3004

6<sup>th</sup> Semester Regular Examination: 2025-26

SUBJECT: Design of Steel Structures

BRANCH(S): CIVIL, CE

Time: 3 Hours

Max Marks: 100

Q.Code: V143

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.

The figures in the right hand margin indicate marks.

(Use of relevant IS codes is permissible)

**Part-I**

**Q1 Answer the following questions:**

**(2 x 10)**

- Write various types of loads to be considered in design of steel structures.
- Define efficiency of a joint.
- What are effective throat dimensions of a fillet weld?
- What is effective diameter of a rivet?
- Define slenderness ratio of a tension member.
- Why circular section is not preferred as compression members?
- Define lateral torsional buckling.
- State the factors that influence the strength of a tension member.
- Where plate girders are used?
- What are the load combinations that are usually considered for truss analysis?

**Part-II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**

**(6 x 8)**

- State the advantages and disadvantages of steel structures.
- Explain how limit state of strength differs from limit state of serviceability.
- List the assumptions made in the design of welded connections.
- Discuss different modes of failure of a tension member.
- Differentiate between web buckling and web crippling of a beam.
- Design a single angle to carry a tensile load of 500 kN. Assume that the length of the member is 3 m.
- With neat sketches explain different types of column bases.
- The plates of a boiler are 10 mm thick, connected by M16 bolts of grade 4.6 at a spacing of 50 mm. If it is lap joint, determine the efficiency of the connection.
- Calculate the value of the least radius of gyration for a compound column consisting of ISHB 250@536.6 N/m with one cover plate 300 mm x 20 mm on each flange.

- j) Discuss the factors affecting lateral stability of beams.
- k) State some advantages and disadvantages of plate girders over trusses.
- l) Discuss various design components of a plate girder with sketches.

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Two plates 180 mm wide and 80 mm thick are to be connected by welding, using shop welds. Design the connection. **(16)**
- Q4** A column section ISHB 450@907.4 N/m is subjected to factored compressive load 650 kN, and moment 80 kNm. Assuming M25 grade concrete design the base plate and the anchor bolt. Assume other suitable values. **(16)**
- Q5** Design a simply supported beam of effective span 2 m carrying a factored concentrated load of 380 kN at mid span. Assume other suitable values **(16)**
- Q6** Design a welded plate girder of span 30 m to carry on superimposed load of 35 kN/m, using intermediate stiffeners. **(16)**

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Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: EEPE3011

6<sup>th</sup> Semester Regular Examination: 2025-26

SUBJECT: Electrical Power Quality

BRANCH(S): EEE, ELECTRICAL

Time: 3 Hours

Max Marks: 100

Q.Code: V254

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.  
The figures in the right-hand margin indicate marks.

**Part-I**

**Q1 Answer the following questions: (2 x 10)**

- Mention the most commonly caused power quality issue and mention one utility caused power quality problem.
- Transient characteristics are predominantly determined by which parameters of transmission line?
- Mention two probable causes of over voltage in distribution system.
- Differentiate between voltage sag and voltage swell.
- Mention two methods of voltage sag mitigation techniques.
- Differentiate between Harmonics and Transient.
- Interpret the benefits of power quality monitoring.
- Mention the objectives of different standards and benchmarks developed by IEEE and IEC.
- Differentiate between UPFC and UPQC.
- Mention two technologies used for harmonic mitigation in distribution system.

**Part-II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)**

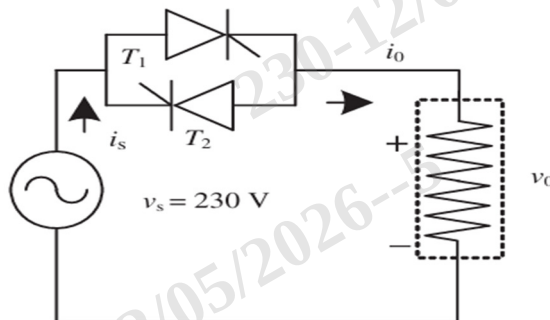
- Define Total Harmonic Distortion. Explain the procedure for calculation the Total Harmonic Distortion (THD) due to disturbance in the power system.
- Describe the CBEMA and ITI curve.
- With neat sketch explain the working of Solid-state transfer switch.
- With neat sketch explain flicker meter.
- Analyze how does lightning cause over voltages?
- With a waveform sketch, explain the terms (a) Voltage sag (b) Voltage interruption.
- Discuss the following characteristics of power quality issue:  
(i) Short duration variations (ii) Long duration variations
- Explain active series compensator to compensate the voltage sag occurs in power system.

- i) Explain with sketch about different types of wave form distortion?
- j) Write a short note on power quality monitoring standards.
- k) Draw the detail schematics of UPFC and explain each component of UPFC.
- l) Explain the impact on energy meter reading due to harmonic distortion.

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Explain in detail about various methods to mitigate voltage swells. (16)
- Q4** Explain details about monitoring requirement of different types of power quality variations. (16)
- Q5** Explain with neat schematics about the principle of operation and characteristics of STATCOM. (16)
- Q6** A single-phase AC voltage controller (shown in Figure) has a resistive load of  $10\ \Omega$ . The input voltage is  $230\text{ V}$  (rms) at  $50\text{ Hz}$ . The thyristor delay angle is  $\alpha = 100^\circ$ . Calculate (a) rms value of load voltage, (b) power consumed, (c) DPF, (d) DF, (e) total harmonic distortion of AC source current (THDI), (f) PF, (g) CF of AC source current, and (h) rms value of AC source current ( $i_s$ ). (16)



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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)

Sub\_Code: MCMC3001

6<sup>th</sup> Semester Regular Examination: 2025-26

SUBJECT: Environmental Engineering

BRANCH(S): AEIE, AUTO, BIOTECH, CIVIL, CSE, CSEAIML, CSEDS, CST, ECE, EE, EEE, EEVDT, ELECTRICAL, ELECTRICAL & C.E, ETC, IT, MECH, METTA, MINING, PT

Time: 3 Hours

Max Marks: 100

Q.Code: V004

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.  
The figures in the right-hand margin indicate marks.

**Part-I**

**Q1 Answer the following questions: (2 x 10)**

- Explain coagulation and flocculation mechanisms.
- Compare water quality requirements for drinking, irrigation, and industrial use.
- Explain the role of service reservoirs in balancing diurnal demand variation.
- Distinguish between separate and combined sewerage systems.
- Differentiate between aerobic and anaerobic treatment processes.
- What are the environmental impacts of improper sewage disposal?
- What are primary and secondary air pollutants? Give examples.
- What are the major sources of urban noise pollution?
- Explain the concept of 3R (Reduce, Reuse, Recycle).
- What are the sources of hazardous wastes?

**Part-II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)**

- Explain breakpoint chlorination and its significance in water treatment.
- Explain the BIS drinking water quality standards (IS 10500). Highlight any four physical, chemical, and bacteriological parameters.
- Explain components of a water supply system.
- Discuss slow sand and rapid gravity filter in detail including working principles.
- Write short notes with suitable sketch for any three (i) Flushing Tanks (ii) Grease & Oil traps (iii) Clean-outs (iv) Street inlets
- Write a short note on Cleaning of Sewers and ventilation.
- Discuss different rational and empirical formula used for calculating storm water runoff. Estimate storm water runoff using Rational Method: Given:  $C = 0.7$ ,  $I = 50$  mm/hr, Area = 80 ha.
- Discuss urban air pollution sources and their relative contribution.
- Discuss monitoring techniques for particulate matter and gaseous pollutants.

- j) Explain methods of noise control at source, path, and receiver.
- k) Explain collection and transportation systems of municipal solid waste.
- l) What do you mean by biomedical waste? Discuss the sources, different categories, and collection for it.

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Write short note on any four: (i) aeration (ii) adsorption (iii) ion exchange (iv) membrane processes (v) sedimentation **(16)**
- Q4** Explain suspended growth and attached growth systems with examples of activated sludge process and trickling filter. Describe with neat sketch. Mention the advantage and disadvantage of these systems. **(16)**
- Q5** Discuss the mechanism of (i) electrostatic precipitator (ii) gravity settling chambers (iii) cyclone separation (iv) wet collectors for removal of particulate matter with its advantage and disadvantage. **(16)**
- Q6** Explain different processing and disposal systems of municipal solid waste. **(16)**

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)

Sub\_Code: MCMC3002

6<sup>th</sup> Semester Regular Examination: 2025-26

SUBJECT: INDUSTRIAL SAFETY ENGINEERING

BRANCH(S): AE, AEIE, AERO, AME, AUTO, BIOMED, BIOTECH, C&EE, CE, CHEM, CIVIL, CSE, CSEAI, CSEAIML, CSEDS, CSIT, CST, ECE, EEE, ELECTRICAL, ELECTRICAL & C.E, ETC, IT, MANUTECH, ME, MECH, METTA, MINERAL, MINING, MME, MMEAM, PLASTIC

Time: 3 Hours

Max Marks: 100

Q.Code: V005

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.

The figures in the right hand margin indicate marks.

**Part-I**

**Q1 Answer the following questions: (2 x 10)**

- What are the primary goals of industrial safety? Why is it important for companies to implement effective industrial safety practices?
- What is an industrial accident? Mention its major causes and types.
- What is equipment economy, and how is it related to the service life of equipment?
- What is the importance of periodic and preventive maintenance in machine tools?
- Name two benefits of Splash lubrication.
- What is the suitable corrosion prevention methods used in steel industry?
- What is meant by overhauling of mechanical components, and why is it necessary in maintenance?
- What are the damages encountered due to chemical reactions and physical abrasion in any industrial process?
- What is product life cycle? Which stage of the product life cycle is characterized by rapid market acceptance and increasing profits?
- What type of maintenance is required for electric motor and Why? Why is regular lubrication important for electric motors?

**Part-II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)**

- Discuss the role of regular maintenance in preventing industrial accidents. Provide examples of common maintenance practices.
- Describe the necessary of periodic maintenance & its relation with replacement economy.
- Explain the types of corrosion found in industrial equipment and highlight their standard prevention methods.
- State and explain different types of tools used for maintenance.
- Describe the steps involved in a typical repair cycle for industrial machinery. Why is each step important?
- Describe the various types of wear and corrosion commonly encountered in chemical plants. Explain any one effective prevention method used to control corrosion in chemical process equipment.

- g) Explain the types, causes, and effects of wear in industrial equipment. Discuss effective wear-reduction methods and conclude with general strategies used to prevent both wear and corrosion.
- h) Discuss the major advantages of preventive maintenance. Explain the repair cycle concept and highlight its importance in effective maintenance planning.
- i) Define decision tree concept in fault finding and solving.
- j) Draw a decision tree for problems encountered in pneumatic machine and explain its significance in solving the problems.
- k) State and explain the advantages of preventive maintenance by taking some suitable examples.
- l) Briefly explain the types and applications of lubricants and the common lubrication methods. With neat sketches, describe the construction, working, and applications of splash lubrication.

### **Part-III**

#### **Only Long Answer Type Questions (Answer Any Two out of Four)**

- Q3** Discuss the different types of mechanical and electrical hazards that occur during industrial operations. Explain the preventive measures that can be implemented to minimize these risks, and highlight the role of safety training and regular maintenance in reducing workplace accidents. **(16)**
- Q4** Discuss the concept of fault tracing and significance of decision tree in sequence of fault finding activities. Draw a decision tree by showing the usual problems found in machine tools and different equipments. Explain its significance in boiler and electrical motors. **(16)**
- Q5** (a) Define Wear and Corrosion. Explain any four types of wear along with their primary causes and effects. **(8)**
- (b) Explain the working principle and applications of the following lubrication methods with the help of a neat general sketch. **(8)**
- Q6** Explain the steps and procedures involved in the periodic and preventive maintenance of (i) machine tools, (ii) pumps, (iii) air compressors, and (iv) diesel generating (DG) sets. Discuss how preventive maintenance programs and schedules are prepared for mechanical and electrical equipment. Highlight the advantages of preventive maintenance and describe the repair cycle concept and its importance in maintenance engineering **(16)**

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)

Sub\_Code: MEPC3005

6<sup>th</sup> Semester Regular Examination: 2025-26

SUBJECT: Mechanical Vibration

BRANCH(S): ME, MECH

Time: 3 Hours

Max Marks: 100

Q.Code: V150

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.  
The figures in the right-hand margin indicate marks.

**Part-I**

**Q1 Answer the following questions:**

**(2 x 10)**

- Define beat phenomenon.
- A vibrating system shows amplitudes of 10 mm and 8 mm in successive cycles. Find logarithmic decrement.
- What is magnification factor?
- What is phase angle in forced vibration?
- What is meant by generalized coordinates?
- Write the matrix form of equation of motion for MDOF system.
- What is meant by principal modes of vibration?
- Define orthogonality of mode shapes.
- What is the difference between discrete and continuous systems?
- A cantilever beam of length 1 m has  $EI = 100 \text{ Nm}^2$  and mass per unit length  $m = 1 \text{ kg/m}$ . Find fundamental frequency.

**Part-II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**

**(6 x 8)**

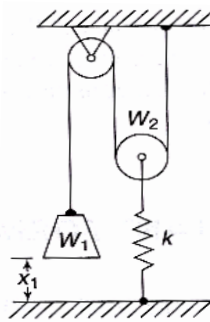
- A system has successive amplitudes 10 mm and 7.5 mm. Time period = 0.5 s. Find: (i) Logarithmic decrement, (ii) Damping ratio, and (iii) Natural frequency.
- A spring-mass system having  $m = 2 \text{ kg}$ ,  $k = 200 \text{ N/m}$ , damping coefficient  $c = 10 \text{ Ns/m}$ . Initial displacement = 0.05 m, and velocity = 0. Find: displacement after 1 sec.
- In a spring mass system, the mass of 10 kg makes 40 oscillations in 20 second without damper. With damper, the amplitude decreases to 0.2 of original value after 5 oscillations. Find out: i) stiffness of spring, ii) logarithmic decrement, and iii) Damping factor.
- A system has  $m = 5 \text{ kg}$ ,  $k = 2000 \text{ N/m}$ , damping ratio  $\zeta = 0.1$ . It is excited by external Force  $F = 100\sin(20t) \text{ N}$ . Find: (i) Amplitude, (ii) Magnification factor, and (iii) (ii) Phase angle.
- What is coulomb damping? Explain the possible conditions of coulomb damping.
- Determine actual displacement,  $Y$  of a machine operating at 2400 rpm, if a vibrometer having natural frequency = 4 Hz placed on the machine shows a relative displacement = 0.2 mm. Assume damping ratio = 0.3 for vibrometer.
- Design a dynamic absorber for a vibrating system with a natural frequency of 10 Hz. The main system has a mass of 2 kg, spring constant of 300 N/m, and damping coefficient of 10 Ns/m. The dynamic absorber should be tuned to minimize the vibration.

- h) What is the static and dynamic coupling? How can you eliminate coupling of the equation of motion?
- i) A 40 kg pump is to be placed at the midspan of a 2.5-m long steel ( $E = 200 \times 10^9 \text{ N/m}^2$ ) beam. The pump is to operate at 3000 rpm. For what values of the cross-sectional moment of inertia will the oscillations of the pump be within 3 Hz of resonance?
- j) Explain with a diagram on the working principle of centrifugal pendulum absorber.
- k) Derive frequency equation for a beam with both ends free and having transverse vibration
- l) Write the short notes of **any two** of the following:  
 a) Stodola method, b) Vibration isolation, and c) Influence coefficient technique.

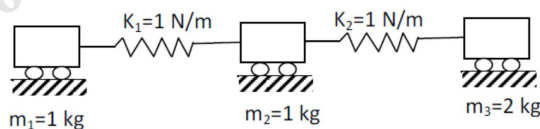
### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3 a) Determine actual displacement,  $Y$  of a machine operating at 2400 rpm, if a vibrometer having natural frequency,  $\omega_n = 4 \text{ Hz}$  placed on the machine shows a relative displacement,  $Z = 0.2 \text{ mm}$ . Assume damping ratio,  $\xi = 0.05$  for vibrometer. (8)
- b) For the ideal system shown below, the weight  $W_1$  hangs at the height  $x_1 = h$  above the floor in the equilibrium configuration. Calculate the period of free vibration of the system in the figure if the weight  $W_1$  performs small oscillations  $x = a \cos pt$  about its position of equilibrium. Neglect the mass of the spring and cord and rotational inertia of the pulleys. The following numerical data are given:  $W_1 = W_2 = 44.5 \text{ N}$ ;  $k = 356 \text{ N/m}$ ;  $x_1 = h = 100 \text{ mm}$ . (8)



- Q4 a) Three rail bogies are connected by springs of stiffness  $40 \times 10^5 \text{ N/m}$  each. The mass of each  $20 \times 10^3 \text{ kg}$ . Determine the frequencies of vibration. Neglect friction between the wheels and rails. (8)
- b) Explain the method to determine the critical speed of shaft carrying single rotor neglecting damping. (8)
- Q5 Find out the natural frequency of the following system shown below by Holzer's method & draw the mode shapes. (16)



- Q6 a) Derive the frequency equation and plot the first three Eigen function for the lateral vibration of a string fixed at both ends. (12)
- b) Write down the one-dimensional wave equation and explain the terms. (4)

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Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: REI5D002/RNM6A002

6<sup>th</sup> Semester Back Examination: 2025-26

SUBJECT: Numerical Methods

BRANCH(S): CSE, CSEAIML, CSEAI

Time: 3 Hours

Max Marks: 100

Q.Code: V346

Answer Q1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.  
The figures in the right-hand margin indicate marks.

**Part-I**

**Q1 Answer the following questions: (2 x 10)**

- Write the definition of significant figures? Determine the number of significant figures in the numbers 0.014050 and  $11.0210 \times 10^4$ .
- What are the conditions of convergence for the iterative function in fixed point iteration method?
- Explain the geometrical interpretation of Newton-Raphson method.
- Write one advantage and one disadvantage of Secant method.
- Are there any restrictions on number of nodes for Simpson's  $\frac{1}{3}$ rd rule? If, yes, what are those?
- What is the geometric interpretation of the Trapezoidal rule?
- Evaluate  $\int_{-1}^1 (1-x^2)^{1.5} \cos x \, dx$  by Gauss-Legendre 1-point formula.
- Find the eigenvalues and eigenvectors of the matrix  $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ .
- Differentiate initial value problem and boundary value problems.
- Solve  $\frac{dy}{dx} = x^2 + y$ ;  $y(0) = 1$  by Euler's method with  $h = 0.1$ . Perform two iterations.

**Part-II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)**

- Find a real root of the equation  $x^3 - 2x - 5 = 0$  using bisection method correct up to 3 decimal places.
- Find a real root of the equation  $x^3 - 2x - 5 = 0$  using the fixed-point iteration method. correct up to 3 decimal places.
- Find inverse of the matrix  $A = \begin{pmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \\ 3 & 1 & 2 \end{pmatrix}$  using LU decomposition method.
- Using Gauss-Seidel method, solve the system of linear equations  $10x_1 + x_2 + x_3 = 12$ ,  $2x_1 + 10x_2 + x_3 = 13$ ,  $2x_1 + 2x_2 + 10x_3 = 14$ . Perform two iterations with initial guess (0,0,0).
- Evaluate  $\int_2^3 \frac{\cos 2x}{1+\sin x} dx$  by Gauss-Legendre 3-point quadrature formula.
- Find an approximate value of  $\int_0^2 \frac{dx}{1+x}$  by Trapezoidal rule with 4-subintervals.
- Using second order Runge-Kutta method, find  $y(0.6)$  if  $\frac{dy}{dx} = y - x^2 + 1$ ,  $y(0) = 0.5$ ,  $h = 0.3$ .

h) Using Lagrange's interpolating formula, find the missing term from the data:

|        |   |    |   |
|--------|---|----|---|
| $x$    | 0 | -1 | 1 |
| $f(x)$ | 1 | —  | 3 |

- i) Find an approximate value of  $\int_0^1 \frac{dx}{1+x^2}$  by using the Romberg integration method, correct up to four decimal places.
- j) Solve by Modified Euler's method for  $\frac{dy}{dx} = -xy^2$ ,  $y(2) = 1$ . Determine  $y(2.2)$ , choosing  $h = 0.1$ . Compare the result with the exact solution.
- k) Solve the boundary value problem  $\frac{d^2y}{dx^2} - y = 0$ , subject to the boundary conditions  $y(0) = 0$ ,  $y(1) = 1.1752$ , using the finite difference method with step size  $h = 0.5$ .
- l) Using improved Euler's method, the initial value problem  $\frac{dy}{dx} = y - \frac{2x}{y}$ ,  $y(0) = 1$  with  $h = 0.1$ , find  $y(0.2)$ .

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** a) Define rate of convergence. Show that the rate of convergence of Secant method is 1.618. (8 x 2)
- b) Solve the following system of linear equations  $2x_1 - 3x_2 + 10x_3 = 3$ ,  $-1x_1 + 4x_2 + 2x_3 = 20$ ,  $2x_1 - 3x_2 + 10x_3 = 3$ ,  $5x_1 + 2x_2 + x_3 = -12$  by the LU decomposition method.
- Q4** a) Given the data points (1, 2), (2, 3), (3, 5), construct the natural cubic spline that interpolates the data. (8 x 2)
- b) Derive Newton's divided difference interpolation formula. Using the derived formula, determine the value of  $f(8)$  from the following data:
- |        |    |     |     |     |      |      |
|--------|----|-----|-----|-----|------|------|
| $x$    | 4  | 5   | 7   | 10  | 11   | 13   |
| $f(x)$ | 48 | 100 | 294 | 900 | 1210 | 2028 |
- Q5** a) Use the Newton-Raphson method to find a real root of the equation  $x \log_{10} x = 1.2$ , correct to four decimal places. (8 x 2)
- b) Using Simpson's one-third rule evaluate  $\int_0^1 x e^x dx$  taking 4 intervals. Compare your result with the exact value.
- Q6** a) Using Runge-Kutta method of fourth order to solve  $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ , given  $y(0) = 1$  at  $x = 0.2$  and  $x = 0.4$  with  $h = 0.2$ . (8 x 2)
- b) Find the largest eigenvalue and the corresponding eigenvector of the matrix A that is  $A = \begin{bmatrix} 4 & 1 & 1 \\ 1 & 3 & -1 \\ 1 & -1 & 2 \end{bmatrix}$  using the Power Method by performing four iterations, starting with the initial vector  $v^{(0)} = [1 \ 1 \ 1]^T$ .

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Total Number of Pages: 02

Course: B.Tech  
Sub\_Code: MEPE3006

6<sup>th</sup> Semester Regular Examination: 2025-26

SUBJECT: POWER PLANT ENGINEERING

BRANCH(S): MECH

Time: 3 Hours

Max Marks: 100

Q.Code: V270

Answer Q1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.  
The figures in the right-hand margin indicate marks.

**Part-I**

**Q1 Answer the following questions: (2 x 10)**

- Specify the four processes of the Rankine cycle.
- What is meant by combined cycle power plant?
- What is the principle of Fluidized Bed Combustion?
- Highlight the purpose of economizers in boilers.
- State the purpose of turbine governing.
- Define carry-over losses in steam turbines.
- State one advantage of surface condensers over jet condensers.
- What is vacuum efficiency?
- Name the main components of a diesel engine power plant.
- What is meant by specific fuel consumption?

**Part-II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)**

- Explain the Carnot vapor cycle with a neat diagram. Discuss the limitations of the Carnot cycle in steam power plants.
- Explain the construction and working of a Water-Tube Boiler with suitable diagram.
- Explain the principle and working of Fluidized Bed Combustion systems.
- A boiler generates 5000 kg/hr of steam at 10 bars from feedwater at 40 °C. The steam produced is dry saturated. If coal consumption is 700 kg/hr and calorific value of coal is 30,000 kJ/kg, calculate (i) Heat supplied to steam, and (ii) Boiler efficiency.
- Describe the construction and working principle of an Impulse Turbine.
- Discuss different energy losses occurring in steam turbines.
- Steam expands in a nozzle from 10 bar and 300 °C to 1 bar. If actual exit velocity is 650 m/s and theoretical velocity is 720 m/s, calculate nozzle efficiency.
- Explain the causes and effects of air leakage in condensers.

- i) Explain the necessity and working principle of cooling towers in power plants.
- j) Cooling water enters a cooling tower at 42 °C and leaves at 30 °C. Wet bulb temperature of air is 26 °C. Determine (i) Range, and (ii) Approach.
- k) Explain the principle of release of nuclear energy through fission.
- l) Describe the construction and working of hydroelectric power plants.

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** a) Steam enters the high-pressure turbine at 5 MPa and 450 °C and expands to 1 MPa. It is reheated to 450 °C and then expanded to 0.1 bar. Determine (i) Total turbine work, (ii) Cycle efficiency, and (iii) Steam rate. **(8 + 8)**
- b) Discuss the construction and working of Integrated Gasification Combined Cycle systems with neat block diagrams.
- Q4** a) Discuss the importance of boiler accessories and mountings in safe and efficient operation of steam generators. **(8 + 8)**
- b) Steam enters the blades of an Impulse Turbine at 1000 m/s with nozzle angle 20°. Blade speed is 400 m/s and outlet angle is 30°. Determine (i) Work done per kg of steam, and (ii) Blade efficiency.
- Q5** a) Derive expressions for condenser efficiency and vacuum efficiency and explain their significance. **(8 + 8)**
- b) Describe different circulating water systems used in thermal power plants.
- Q6** a) Discuss the performance characteristics and operational problems of diesel engine power plants. **(8 + 8)**
- b) Discuss safety systems and environmental aspects of nuclear power plants.

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Total Number of Pages: 02

B.Tech/IDD (B.Tech & M.Tech)  
EEPE3006

**6<sup>th</sup> Semester Regular Examination: 2025-26**  
**POWER STATION ENGINEERING**  
**BRANCH: ELECTRICAL, ELECTRICAL & C.E**

**Max Marks: 100**

**Time: 3 Hours**

**Q.Code: V218**

**Answer Q1 (Part-I) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.**  
**The figures in the right-hand margin indicate marks.**

**Part- I**

**Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)**

- Calculate the Load Factor of a plant that generates 1,00,000 kWh in 24 hours with a peak load of 10 MW.
- Differentiate between Base Load and Peak Load plants with examples.
- What is the Diversity Factor? Explain why a higher diversity factor is beneficial for a power system.
- Define 'Run-off' in the context of hydrological cycles.
- What is 'Pondage' in hydro power stations? Briefly explain.
- What is the role of an 'Economizer' in a thermal power plant?
- What is electrostatic precipitator? Briefly explain.
- Differentiate between Nuclear Fission and Fusion.
- State two desirable properties of a moderator in a nuclear reactor.
- List four non-conventional sources of energy.

**Part- II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)**

- A residential consumer has the following load pattern: 00:00-06:00 Hr - (200W), 06:00-18:00 Hr - (No Load), 18:00-22:00 Hr - (1000W), 22:00-00:00 Hr - (300W). Plot the load curve. Find the average load, the maximum load, the load factor and the electric energy consumption during the day.
- Discuss the various factors affecting the site selection for a Thermal Power Plant.
- A power station has a maximum demand of 15,000 kW, a load factor of 70 %, a plant capacity factor of 52.5 % and a plant use factor of 85 %. Find:
  - the daily energy produced.
  - the reserve capacity of the plant
  - the maximum energy that could be produced daily if the plant were in use all the time
  - the maximum energy that could be produced daily if the plant, operating in accordance with operating schedule, is fully loaded when in operation.
- A hydro plant operates under an effective head of 100 m with a discharge of 15 m<sup>3</sup>/sec. If the overall efficiency of the plant is 80 %, calculate the electrical power output in kW.

- e) Explain the function of a Surge Tank in a hydro-electric plant. Describe how it protects the Penstock against water hammer effects during sudden load rejections.
- f) Determine the specific speed of a turbine that develops 8000 kW at 250 rpm under a head of 100 m. Identify which turbine (Pelton, Francis, or Kaplan) is most suitable for this specific speed.
- g) A steam station has an overall efficiency of 28 %. If the calorific value of the coal used is 6400 kcal/kg, calculate the amount of coal consumed to generate 1 kWh of electrical energy.
- h) Compare 'Forced Draught' and 'Induced Draught' systems used in thermal power plants.
- i) Describe the function of a Condenser and explain the difference between an open-circuit and a closed-circuit (cooling tower) cooling water system.
- j) Discuss the safety and environmental issues associated with nuclear waste disposal and the selection of a site for a nuclear plant.
- k) What is a chain reaction? How is the nuclear reaction controlled in a reactor?
- l) Describe the working principle of a Geothermal power plant. What are the primary geographical constraints for setting up such a plant?

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** a) Describe the Two-part Tariff and Three-part Tariff systems. Discuss the economic justification for charging consumers based on their maximum demand rather than just energy consumption. (8)
- b) A 100 MW thermal power station has the following annual costs: Fixed Charges: Rs. 200 per kW of maximum demand. Running Charges: 15 Paise per kWh generated. The station operates with a maximum demand of 75 MW and an annual load factor of 40 %. Calculate the total annual cost and the overall cost per unit (kWh) generated. (8)
- Q4** a) Draw a neat schematic diagram of a Hydro-electric Power Plant and label all major components. (10)
- b) Explain the classification of Hydro-electric plants based on available head and nature of load (6)
- Q5** a) Draw a neat block diagram of a Thermal Power Plant showing the coal and ash circuit and the cooling water circuit. Explain the role of the Economizer. (8)
- b) Discuss the Natural, Induced, and Forced draft systems used in boilers. Why is a "balanced draft" system often preferred in high-capacity water tube boilers? (8)
- Q6** a) Explain the essential components of a nuclear reactor, specifically detailing the functions of the Moderator, Control Rods, and Reflector. Compare the merits of using Heavy Water ( $D_2O$ ) versus Graphite as a moderator. (10)
- b) Critically compare the non-conventional power plants with traditional sources of electrical energy. (6)

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)

Sub\_Code: EEPC3004

6<sup>th</sup> Semester Regular Examination: 2025-26

SUBJECT: Power System - II

BRANCH(S): EE, EEE, ELECTRICAL, ELECTRICAL & C.E

Time: 3 Hours

Max Marks: 100

Q.Code: V109

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.

The figures in the right-hand margin indicate marks.

**Part-I**

**Q1**

**Answer the following questions:**

**(2 x 10)**

- Define complex power.
- The p.u. impedance value of an alternator corresponding to base values 13.2 kV and 30 MVA is 0.2 p.u. Calculate the p.u. value for base values of 13.8 kV and 50 MVA.
- Write down the different types of buses specified for Load flow studies.
- Why frequency should remain constant? Explain briefly.
- What is the function of speed changer in a turbine speed governing system?
- Define incremental fuel cost.
- What is steady state stability limit?
- What is the significance of Control Area with respect to Load frequency control?
- What is the difference between symmetrical fault and unsymmetrical fault.
- Write two properties of Bus admittance matrix.

**Part-II**

**Q2**

**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**

**(6 x 8)**

- Consider a four-bus system with line impedances are given as below:  
Bus 1 to Bus 2  $j0.2 \text{ ohm}$   
Bus 2 to Bus 4  $j0.25 \text{ ohm}$   
Bus 3 to Bus 4  $j0.3 \text{ ohm}$   
Bus 3 to Bus 1  $j0.5 \text{ ohm}$   
Bus 4 to Bus 1  $j0.8 \text{ ohm}$   
Draw the configuration of the system and also find the Bus Admittance matrix.
- Develop the coordination equation with losses.
- Explain different components of AGC system with a neat diagram and the working mechanism.
- Compute the following in polar form  
i)  $\alpha^2 - 1$     ii)  $1 - \alpha - \alpha^2$     iii)  $3\alpha^2 + 4\alpha + 2$     iv)  $j\alpha$
- Determine the symmetrical components of three voltages  
 $V_a = 200 \angle 0^\circ$ ,  $V_b = 200 \angle 245^\circ$  and  $V_c = 200 \angle 105^\circ \text{ V}$

- f) Draw the PU impedance diagram for the power system shown in Fig. 2 (b) below. Neglect resistance, and use a base of 100 MVA, 220 kV in 50-ohm line. The ratings of the generator, motor and transformers are

|                 |         |                |               |
|-----------------|---------|----------------|---------------|
| Generator       | 40 MVA, | 25 kV,         | $X'' = 20 \%$ |
| Motor           | 50 MVA, | 11 kV,         | $X'' = 30 \%$ |
| Y-Y transformer | 40 MVA, | 33 Y-220 Y kV, | $X = 15 \%$   |
| Y-Δ transformer | 30 MVA, | 11 Δ-220 Y kV, | $X = 15 \%$   |

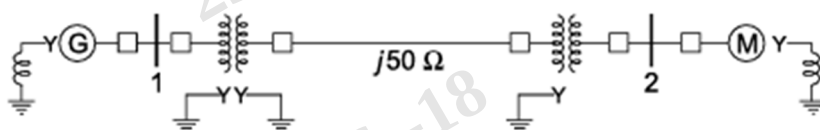


Fig. 2 (b)

- g) What is load flow solution? Explain its significance in power system analysis. Compare different types of load flow studies in terms of rate of convergence, computational complexity, memory requirement, and accuracy.
- h) Incremental fuel costs in rupees per MWh for a plant consisting of two units are:
- $$\frac{dC_1}{dP_{G1}} = 0.2P_{G1} + 40.0$$
- $$\frac{dC_2}{dP_{G2}} = 0.25P_{G2} + 30.0$$
- The minimum and maximum loads on each unit are to be 20 MW and 125 MW respectively. Determine the incremental fuel cost and the allocation of load between units for minimum cost when the loads are 175 MW. Assume both units are operating.
- i) A single-phase resistive load of 100 kVA is connected across lines b c of a balanced supply of 3 kV. Compute the symmetrical components of the line currents.
- j) Develop the voltage and current relationship for a L-G fault.
- k) What is Unit Commitment. Explain any one method of solving the UC problem.
- l) Develop the block diagram of LFC of a single area system.

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Draw the flow chart of Gauss – Seidel method of load flow studies including PV buses. Explain each block. (16)
- Q4** Two generators rated 200 MW and 400 MW are operating in parallel. The droop characteristics of their governors are 4 % and 5 % respectively from no load to full load. Assuming that the generators are operating at 50 Hz at no load. How would a load of 600 MW be shared between them? What will be the system frequency at this load? Assume free governor action. (16)
- Q5** Distinguish between steady state, transient, and dynamic stability. Derive power angle equation. (16)
- Q6** Develop and draw the block diagram model of Two area load frequency control along with tie line. (16)

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)

Sub\_Code: HSHS3003

6<sup>th</sup> Semester Regular Examination: 2025-26

SUBJECT: Professional Ethics

BRANCH(S): AEIE, CE, CSE, CSEAIML, CSIDS, CST, ECE, EE, EEE, EEVDT,  
ELECTRICAL, ETC, IT

Time: 3 Hours

Max Marks: 100

Q.Code: V048

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.

The figures in the right hand margin indicate marks.

**Part-I**

**Q1 Answer the following questions: (2 x 10)**

- What is the difference between Morals and Ethics?
- How does Emotional Intelligence (EI) relate to Ethics?
- What do you mean by the concept: "Myth of a Moral Business"?
- What are the three levels of Kohlberg's Moral Development?
- What is Aristotle's "Virtue Ethics"?
- How do Personal and Professional Ethics differ?
- What is "Professional Accountability"?
- What are the Organization's duties toward the Professional?
- What is the meaning of an "Ethical Code"?
- What is the "Compliance vs. Integrity" limitation?

**Part-II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)**

- What is the primary purpose of Engineering Ethics? Explain the concept of "Engineering as Social Experimentation".
- What are the three "Types of Inquiry" used to resolve engineering dilemmas?
- How should an engineer distinguish between "Safety" and "Risk"? Explain with example.
- How is a "Risk-Benefit Analysis" applied ethically? Explain the important theories.
- Distinguish between a "Profession" and "Craftsmanship." Why is the distinction vital for institutional leadership?
- How does a "Conflict of Interest" jeopardize professional integrity, and what are the standard strategies to manage it?
- Compare "Rights Theory" and "Casuist Theory" in a management context.
- Explain the practical differences between Moral Absolutism, Relativism, and Pluralism.

- i) Analyze the Significance and Limitations of "Codes of Ethics" in institutional governance.
- j) Why is "Ethics Training" considered a strategic investment rather than a compliance cost?
- k) Discuss the relationship between "Laws enforcing Ethical Issues" and the concept of "Self-Regulation."
- l) How does the concept of "Sustainable Development" redefine the traditional objectives of Corporate Social Responsibility (CSR)?

### **Part-III**

#### **Only Long Answer Type Questions (Answer Any Two out of Four)**

- Q3** Compare and contrast the Moral Development theories of Jean Piaget and Lawrence Kohlberg. How do these stages reflect the way an individual views authority? **(16)**
- Q4** Contrast the application of Consequentialism (Utilitarianism) and Deontology in the context of institutional restructuring. **(16)**
- Q5** Discuss the tension between Moral Absolutism and Moral Relativism in global business operations. **(16)**
- Q6** "Engineering is not merely a technical trade, but a form of social experimentation". Critically analyze this perspective and its implications for professional accountability. **(16)**

Registration No.:

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)

Sub\_Code: CSPC3005

6<sup>th</sup> Semester Regular Examination: 2025-26

SUBJECT: Software Engineering

BRANCH(S): CE, CSE, CSIT, CST, ELECTRICAL & C.E, IT

Time: 3 Hours

Max Marks: 100

Q.Code: V162

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.

The figures in the right-hand margin indicate marks.

**Part-I**

**Q1 Answer the following questions: (2 x 10)**

- a) Define software engineering and explain its importance.
- b) Differentiate between classical and agile process models.
- c) What is a work breakdown structure (WBS)?
- d) Explain risk management in software projects.
- e) What is requirements elicitation?
- f) Differentiate between cohesion and coupling.
- g) What is regression testing?
- h) Explain software configuration management.
- i) What is reverse engineering?
- j) State any two types of software maintenance.

**Part-II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)**

- a) Compare waterfall and spiral models.
- b) Explain agile project management with an example.
- c) What are software metrics? Give examples.
- d) Explain requirement validation techniques.
- e) What is modularity in software design?
- f) Discuss object-oriented design principles.
- g) Explain mutation testing with an example.
- h) What is DevOps testing?
- i) Explain mobile app testing challenges.
- j) What is software reuse?
- k) Discuss CASE tools in software engineering.
- l) Explain the concept of refactoring in design.

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** a) Compare classical process models with agile models using suitable examples. (8)  
b) Prepare a project plan for a library management system including scope, milestones, and cost estimation. (8)
- Q4** a) Perform requirements elicitation for an online food delivery system. Identify functional and non-functional requirements. (8)  
b) Draw a system model (use case diagram) for the same. (8)
- Q5** a) Design an object-oriented model for a hospital management system. (8)  
b) Explain cohesion and coupling in the context of your design. (8)
- Q6** a) Prepare a test plan for an e-commerce application covering unit, integration, and system testing. (8)  
b) Discuss regression testing and mutation testing with examples from the same application. (8)

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)

Sub\_Code: EOPC3002

6<sup>th</sup> Semester Regular Examination: 2025-26

SUB: DIGITAL SIGNAL PROCESSING

BRANCH: EE, EEE, ELECTRICAL

TIME: 3 HOURS

MAX MARKS: 100

Q.Code V145

Answer Q1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

**Part- I**

**Q1 Only Short Answer Type Questions (Answer All-10)**

**(2 x 10)**

- Find the Discrete Fourier Transform of  $\delta(n) + \delta(n-1) - \delta(n-4)$ .
- Find the linear convolution of  $x(n) = \{-1, 3, 1\}$  and  $k(n) = \{-1, 1, 1\}$ .
- Find Z-transform of  $u(n) + \delta(n)$ .
- Define a linear phase FIR filter.
- What is the fundamental difference between a linear and a nonlinear discrete time system?
- Define the commutative property of Z-Transform.
- Draw a radix-2, four-point DIT-FFT structure.
- What is the computational complexity of a 4-point DFT in terms of number of additions and multiplications.
- What is superposition theorem to check linearity of a discrete time system?
- Write about any two applications of DSP in speech and image enhancement.

**Part- II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**

**(6 x 8)**

- Using partial fraction method, find the inverse z-Transform of the following transfer function,  
$$H(z) = \frac{4z^{-1}-4}{10z^{-2}+7z^{-1}+1}.$$
- For an analog system response  $H(S) = \frac{b}{s+a}$  prove that  $H(Z) = \frac{b}{T \left( \frac{1-Z^{-1}}{1+Z^{-1}} \right) + a}.$
- Show that for linear phase FIR filter  $H(k) = H(N-1-k)$  and  $\alpha = \frac{N-1}{2}.$
- Determine the inverse Z-transform of by the partial fraction expansion method  $X(z) = \frac{z+2}{2z^2-7z+3}$ , if the ROCs are (i)  $|z| > 3$  and (ii)  $\frac{1}{2} < |z| < 3.$
- Find the DIF-FFT of  $x(n) = \{-2, 1, 0, -2\}.$
- Compute N-point DFT of a sequence given by  $x(n) = \delta(n-1) + u(n-1), 0 \leq n \leq 5.$
- Design the direct form structure of the FIR system described by  $H(z) = 2 + \frac{1}{4}z^{-1} + \frac{3}{4}z^{-2} + \frac{1}{8}z^{-3} + \frac{1}{16}z^{-4} + \frac{1}{32}z^{-5}.$

- h) Find the circular convolution of  $u(n) = \{1, 1, 2, 1\}$  and  $h(n) = \{3, 2, 1, 3\}$ .
- i) For a system defined as  $y(n) = x(n) - x(n-1) - x(n-2) + \frac{1}{x(n-2)}$ , Check if the system is LTI or not?
- j) Differentiate between the characteristics of Butterworth and Chebyshev filters.
- k) Find the long-division convolution between  $x(n) = \{3, -1, 0, 1, 3, 2, 0, 1, 2, 1, 1, 3, 1\}$  and  $h(n) = \{1, 2, 1\}$  using overlap add method.
- l) Explain the impulse invariant method for design of IIR filters. Draw the block diagram of an adaptive system identification.

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** Write short notes (any two) (8 + 8)
- a) Bilinear Transformation Method
  - b) Properties of DFT
  - c) Design of FIR filters
  - d) Properties of Z-Transform
- Q4** The output of an impulse response is given by,  $H(z) = \frac{10z(z^2-6)}{z^3-2z^2+z-1}$ , draw the block diagram of (6 + 6 + 4)
- (a) Direct-form-I
  - (b) Direct form-II
  - (c) Signal flow graph of Direct form-II
- Q5** a) If  $x[n]$  is an even length sequence with an N-Point DFT  $X(k)$ , then determine the N-Point DFT of  $y[n] = x[n] - x[n - \frac{N}{2}]$  in terms of  $X(k)$ . (8 + 8)
- b) Find bilinear transform to  $H(s) = \frac{s+2}{(s+10)(s+7)}$  with  $T = 0.25$  sec and find  $H(z)$ .
- Q6** a) Find the DIT-FFT of  $x(n) = \{1, 4, 16, 32\}$ . (8 + 8)
- b) Convert the analog IIR filter into the digital IIR using impulse invariant method for given transfer function  $H(s) = \frac{(s+0.8)}{(s+0.8)^2+64}$ .

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Total Number of Pages: 02

Course: B.Tech/IDD (B.Tech & M.Tech)

Sub\_Code: CIPC3005

6<sup>th</sup> Semester Regular Examination: 2025-26

SUBJECT: Water Resources Engineering

BRANCH(S): CE, C&EE, CIVIL

Time: 3 Hours

Max Marks: 100

Q.Code: V111

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.  
The figures in the right-hand margin indicate marks.

**Part-I**

**Q1 Answer the following questions: (2 x 10)**

- Differentiate between GCA and CCA. Also, define the intensity of irrigation.
- Rainfall of intensity of 25 mm/h occurred over a watershed of 100 ha for an 8 hr. The measured direct runoff volume in the stream draining the watershed was 40,000 m<sup>3</sup>. Calculate the precipitation not available for runoff.
- What is the significance of duty, and mention two measures to improve duty?
- Why is the lining of the canal done? Also, mention types of lining commonly adopted.
- A 90 km<sup>2</sup> catchment has a 4-hour unit hydrograph which can be approximated as a triangle. Calculate the time base if this unit hydrograph's peak ordinate is 10 m<sup>3</sup>/s?
- Mention the factors responsible for reducing the evaporation process.
- Differentiate between total runoff and surface runoff.
- What do you understand by the routing of a flood?
- Define the Instantaneous unit hydrograph.
- Explain the difference between evaporation and transpiration.

**Part-II**

**Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)**

- Explain the terms: field capacity, permanent Wilting Point, Kor period, Base period, and Crop period.
- Explain various canal alignments with sketches.
- Explain the concept of Intensity–Duration–Frequency (IDF) curves and their importance in engineering design. How are they developed?
- What is the two-step procedure of discharge measurement? Also, explain the Area-velocity method of discharge measurement.
- Explain Gumbel's method for flood frequency analysis with its assumptions and limitations.
- Define a hydrograph. Explain its components and discuss methods of baseflow separation.

- g) The rating curve of a current meter is given by  $v = 0.51N_s + 0.03$  m/s, where  $N_s$  is the revolution per second. Find Discharge if the current meter reading is as shown in Table below.

|                        |   |     |     |     |     |     |      |      |
|------------------------|---|-----|-----|-----|-----|-----|------|------|
| Distance from left (m) | 0 | 1.0 | 3.0 | 5.0 | 7.0 | 9.0 | 11.0 | 12.0 |
| Depth (m)              | 0 | 1.1 | 2.0 | 2.5 | 2.0 | 1.7 | 1.0  | 0    |
| No. of Revolution      | 0 | 39  | 58  | 112 | 90  | 45  | 30   | 0    |
| Time (s)               | 0 | 100 | 100 | 150 | 150 | 100 | 100  | 0    |

- h) Explain various losses in canals and discuss the importance and types of canal lining.  
i) Explain different types of reservoir storage zones and discuss methods for estimating reservoir capacity using mass curve.  
j) Explain methods of streamflow measurement. Compare velocity-area method and slope-area method.  
k) Explain factors affecting reservoir sedimentation and methods to reduce it.  
l) Discuss hydrological reservoir routing using the Modified Puls method.

### Part-III

#### Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3 a)** After how many days will you supply water to the soil to ensure efficient irrigation of the given crop if the (i) Field capacity of soil = 35 %, (ii) Permanent wilting point = 15 %, (iii) Density of soil =  $1.5 \text{ g/cm}^3$  (iv) Daily consumption use of water for the given crop = 12 mm. (v) Effective depth of root zone = 80 cm. (8)

- b)** The following Table shows the Gumbel method's estimated flood peaks and corresponding return periods. (8)

| Peak flood ( $\text{m}^3/\text{s}$ ) | Return period (Years) |
|--------------------------------------|-----------------------|
| 30,000                               | 50                    |
| 52,500                               | 100                   |

Find out the amount of peak flood corresponding to a 500-year return period.

- Q4 a)** Describe the rating curve and explain how it is developed and extrapolated. (8)  
**b)** The following are the ordinates of the hydrograph of flow from a catchment area of  $800 \text{ km}^2$  due to a 6-h rainfall. Derive the ordinates of the 6-h unit hydrograph. Make suitable assumptions regarding the base flow. (8)

|                                     |    |    |     |     |     |     |     |     |     |     |    |    |    |
|-------------------------------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|
| Time (h)                            | 0  | 6  | 12  | 18  | 24  | 30  | 36  | 42  | 48  | 54  | 60 | 66 | 72 |
| Discharge ( $\text{m}^3/\text{s}$ ) | 40 | 65 | 215 | 360 | 400 | 350 | 270 | 205 | 145 | 100 | 70 | 50 | 42 |

- Q5 a)** Explain the concept of Depth–Area–Duration (DAD) curves and Probable Maximum Precipitation (PMP). Discuss their significance in the design of spillways and flood control structures. (8)

- b)** Write Horton's Infiltration equation. Explain the double-ring infiltrometer with adjustable depth of flooding with the help of a neat sketch. (8)

- Q6 a)** Describe conceptual flood routing models such as Clark's method and Nash model. (8)

- b)** Explain the S-curve method for deriving unit hydrograph of different durations. (8)