7E1812

Roll No. _____ Total No. of Pages: 3

7E1812

B. Tech. VII - Sem. (Main / Back) Exam., - 2024

Civil Engineering

7CE4-01 Transportation Engineering

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 What are the different modes of transportation?

Q.2 List out the various factors governing highway alignment.

Q.3 List out the various laboratory test of bitumen.

Q.4 Enumerate classification of roads as per Nagpur Road Plan in India.

Q.5 List out the various physical properties of stone aggregates.

Q.6 What are the objectives of camber?

Q.7 List out different type of sleepers used in railway.

Q.8 What are the basic function of ballast material in Railway line?

Q.9 What do you understand by runway?

Q.10 What is the difference in between port and harbors?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 What are the polices and goals of the Second Road Development Plan for 1961 - 1981?

Q.2 List out the desirable properties of road aggregates. Explain Aggregate Impact Value laboratory test of road aggregates with the help of neat diagrams.

Q.3 Calculate the safe stopping sight distance for design speed of 50 kmph. Assume a reaction time of 2.5 seconds, coefficient of friction of 0.35 -

(a) For two way traffic on two lane road.

(b) For two way traffic on one lane road.

Q.4 Write short notes on the following equipment's for highway construction -

(i) Bull dozer

(ii) Rollers

Q.5 Explain different types of rail fastenings in detail with neat sketch.

Q.6 Write a brief note on airport classification.

Q.7 Explain classification of various types of harbors, ports and docks.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 (a) Explain features of rural roads including those in (Pradhan Mantri Gram Sadak Yojna) (PMGSY).

(b) Write down the construction steps for gravel road in detail.

Q.2 (a) Give differences in between Bitumen and Tar.

(b) What do you understand by Flexible Pavement? Explain any one design method for Flexible pavement design.

Q.3 The design speed of highway is 80 kmph. There is a horizontal curve of radius 200 m on a certain locality. Calculate the super elevation needed to maintain this speed. If the maximum super elevation of 0.07 is not to be exceeded, calculate the maximum allowable speed on this horizontal curve as it is not possible to increase the radius. Safe limit of transverse coefficient is 0.15.

Q.4 (a) Explain the relative merits and demerits of different type of sleepers.

(b) Explain the various types of gauge use in railway.

Q.5 Write short notes on the followings -

(i) Apron

(ii) Runway

(iii) Hangers

(iv) Port

(v) Harbours

7E1712

Roll No. _____ Total No. of Pages: 3

7E1712

B. Tech. VII - Sem. (Re Back) Exam., - 2024

Civil Engineering

7CE4-01 Transportation Engineering

Time: 3 Hours **Maximum Marks: 120**
Min. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Define alignment in brief. [2]

Q.2 Name different types of road pattern in India. [2]

Q.3 Define camber of road. [2]

Q.4 List out different types of gradients. [2]

Q.5 Define Flakiness index and Elongation index. [2]

Q.6 What is PQC and DLC? [2]

Q.7 What is embankment? [2]

Q.8 What is Roller compacted concrete road? [2]

Q.9 Name the components of Permanent way. [2]

Q.10 What is breakwater? [2]

PART – B [5×8=40]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 What are the requirements of ideal highway alignment? Also explain factors controlling the alignment. [8]

Q.2 Calculate OSD for a two-way Highway having design speed of 80 kmph and acceleration is 0.69. Assume any data if required. [8]

Q.3 Discuss superelevation of highway with neat diagram. Also prove that $e + f = \frac{v^2}{gR}$. [8]

Q.4 What are the desirable properties of aggregate? Also explain the test to determine hardness of aggregate. [8]

Q.5 Explain difference between rigid and flexible pavement in tabular form. Draw neat diagram also. [8]

Q.6 A pavement slab having width 4.5m and thickness 25cm design contraction joints, if (i) PCC used (ii) RCC used

(a) Coefficient of sub-grade friction = 1.5

(b) The allowable unit stress in tension in cement concrete = 0.8 kg/cm^2

(c) Permissible stress in steel in tension = 1400 kg/cm^2

For RCC 12 mm diameter bars @ 300mm c/c spacing has been used. [8]

Q.7 What are the factors to be considered while selection of site for airport? [8]

PART – C

[4×15=60]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any four questions

Q.1 The radius of a horizontal curve is 200 m, the total pavement width at curve is 7.0 m and superelevation is 7%. Design the transition curve length for a speed of 100 kmph. Assume pavement to be rotated about the inner edges. Also calculate the shift of the curve. Assume any data if required. [15]

Q.2 Explain steps involve in highway construction. What are the equipment's used in compaction of different layers of pavements? Explain in detail. [15]

Q.3 A CC pavement slab of thickness 22 cm is considered over a GSB having modulus of reaction 18 kg/cm^3. The maximum temperature difference between the top and bottom of the slab during summer day and night is found to be 20 °C, the design wheel load is 4500 kg, radius of contact area is 15cm, E value of CC is 3×10^5 kg/cm^2, Poisson's ratio is 0.15 and coefficient of thermal expansion of CC is 12×10^{-6} per °C and friction coefficient is 1.5. Find out stress due to load and temperature. Also find out worst combination of stress at the edge. $C_x = 1.05$ and $C_y = 0.9$. Transverse joints at 5.5 m interval whereas longitudinal at 4.2 m interval. [15]

Q.4 (a) Explain the term Superelevation. What is the objective to providing superelevation on curve of railway track? [8]

(b) Write short notes on – [7]

(i) Equilibrium Cant

(ii) Cant Deficiency

Q.5 (a) Describe various types of runway pattern with the help of neat sketches. [8]

(b) Write short notes on – [7]

(i) Hanger

(ii) Apron

7E1821

Roll No. _____ Total No. of Pages: 2

7E1821

B. Tech. VII - Sem. (Main / Back) Exam., - 2024

Computer Science & Engineering

7CS4-01 Internet of Things

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Explain the role of things in IoT.

Q.2 What is the use of GPIO Pins in an IoT device?

Q.3 Explain the flavors of Linux OS supported by Raspberry Pi device.

Q.4 What is the use of SPI interface on Raspberry Pi?

Q.5 What are 4 aspects in one's business to Master IoT?

Q.6 What role does the network play in the Internet of everything?

Q.7 Live few examples of impact of Internet of Things (IoT) on our lives.

Q.8 What are interrupts in Arduino?

Q.9 What Python libraries used in Raspberry Pi to control GPIO Pins?

Q.10 What is application of IoT in Healthcare?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain the major services used in cloud computing technology.

Q.2 Describe how wireless sensor networks become one of the enabling technologies of IoT?

Q.3 Explain the differences between Machines in M2M and Things in IoT?

Q.4 Describe the structure of Network Function Virtualization for IoT.

Q.5 What impacts will the Internet of Things (IOT) have on transportation sector?

Q.6 Write down the differences between Rest API and Web Socket API.

Q.7 Describe the steps for designing IoT system with neat diagram.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Explain the role of big data analysis in IoT and define its characteristics.

Q.2 Explain how IoT technology used to enable the agricultural industry to increase operational efficiency, lower costs, reduce waste and improve the quality of their field?

Q.3 Describe the implementation of IoT technology into distributed energy system to optimize the efficiency of energy infrastructure and reduce wastage in the renewable energy systems.

Q.4 Explain functional view, information view, deployment and operational view and other relevant architectural views of IoT reference architecture.

Q.5 Write short note on -

(i) Lite OS (ii) Contiki OS (iii) Ultra Sonic Sensor

7E1721/7E1903

Roll No. _____ Total No. of Pages: 2

7E1721/7E1903

B. Tech. VII - Sem. (Re Back) Exam., - 2024

Computer Science & Engineering

7CS4-01 Internet of Things

Time: 3 Hours **Maximum Marks: 120**

Min. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Define Internet of Things.

Q.2 Define Wireless Sensor Networks (WSN).

Q.3 What is cloud computing?

Q.4 Illustrate Machine to Machine (M2M) Communication.

Q.5 Explain TinyOS.

Q.6 What is Arduino?

Q.7 Define Uniform Resource Identifiers (URIs).

Q.8 Write design challenges in IoT.

Q.9 What are smart cities?

Q.10 How IoT is helpful in health care?

PART – B

[5×8=40]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain IoT communication APIs in detail.

Q.2 What is the difference between sensors and actuators? Explain with an example.

Q.3 Describe Home Automation in domain specific IoT.

Q.4 Compare the differences and similarities between IoT & M2M.

Q.5 Compare the differences between SDN and NFV for IoT.

Q.6 What are the challenges in IoT? Explain the development and security challenges in detail.

Q.7 Explain the use of IoT for farmers and in agriculture in detail.

PART – C

[4×15=60]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any four questions

Q.1 What are the different layers of IoT protocols? Explain functions of all the layers.

Q.2 Explain in detail about network function virtualization.

Q.3 Explain Representational State Transfer (REST) architectural style. Also explain the REST method.

Q.4 What is Software Defined Networks (SDN)? What are the four key characteristics of an SDN architecture? Explain the layers of SDN.

Q.5 Illustrate any three case study of IoT applications (cities, environment, energy, industry or lifestyles).

7E1832

Roll No. _____ Total No. of Pages: 3

7E1832

B. Tech. VII - Sem. (Main / Back) Exam., - 2024

Electrical Engineering

7EE5-11 Wind and Solar Energy Systems

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A [10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 What is the value of Betz's coefficient? What does it signifies?

Q.2 Define Tip Speed Ratio (TSR).

Q.3 Name the power on which variable speed wind turbines have control.

Q.4 What is the full form of WECS?

Q.5 In solar geometry, which angle is known as Surface Azimuth Angle (γ)?

Q.6 What does Local Apparent Time (LAT) signifies?

Q.7 What is the full form of MPPT?

Q.8 Define Fill Factor (FF).

Q.9 Give two reasons why induction generators are used in Wind Turbines?

Q.10 Give two applications of solar thermal power generators.

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Write a short note on historical background & development of wind power in India. Also identify the gaps in using wind power as main energy source.

Q.2 "Solar geometry plays a vital role in various practical applications", support this statement with the significant applications of solar geometry in day to day life.

Q.3 Briefly explain the terms Solar Declination (δ) and Solar Elevation angle (Altitude).

Q.4 Briefly explain solar PV and wind farm behavior during grid disturbances.

Q.5 Write a short note on Doubly-Fed Induction Generators (DFIG) and briefly explain their characteristics.

Q.6 Analyze V-I characteristics of a PV cell.

Q.7 How does a Solar Pond work? Also discuss its applications.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 In wind generation topology, explain the operation and control of a Doubly-Fed Induction Generator (DFIG) system. Also discuss their applications.

Q.2 What are the recent technologies used in the installation of wind farms in India? Narrate the challenges in installation of wind farms in India. Suggest in your own words how these challenges can be answered. Also enlist the applications and advantages of wind energy generation.

Q.3 Explain the Parametric Models and Decomposition Models that can determine diffuse solar radiation on horizontal surfaces. Also discuss about the advantages and limitations each such model.

Q.4 Explain hybrid and isolated operations of solar PV and wind systems.

Q.5 Explain any two of the followings technologies in solar thermal power generation -

(A) Parabolic Dish (B) Central Receivers (C) Fresnel

7E1847

Roll No. _____ Total No. of Pages: 2

7E1847

B. Tech. VII - Sem. (Main / Back) Exam. - 2024

Mechanical Engineering

7ME5-11 I. C. Engines

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 What is the Mechanical Efficiency of an IC engine?

Q.2 Draw PV diagrams of Otto Cycle and Diesel Cycle.

Q.3 Why the size of SI engine cylinder is limited by approx. 100mm?

Q.4 Write the four differences between CI and SI engine.

Q.5 What is the importance of swirl and turbulence in combustion?

Q.6 Write the name of alternative fuels for SI and CI engines.

Q.7 Draw Battery Ignition System for SI engine.

Q.8 Write various properties of lubrication oil for IC engines.

Q.9 What is the need of cooling in IC engine?

Q.10 Draw any two designs of combustion chamber for SI engine.

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain air standard and actual cycles for SI engine operation.

Q.2 How indicating power of IC engine determined? Write the name of different methods and explain Willan's Line Method for finding indicating power of a CI engine.

Q.3 What is the Delay Period in CI engine combustion? What are the factors that affect delay period? Explain.

Q.4 Draw four stage combustion diagram of CI engine and explain all four stages in short.

Q.5 Draw and explain mechanical fuel pump for SI engine vehicles.

Q.6 Draw and explain Electronic Ignition System for a SI engine.

Q.7 Define Scavenging Process. What is the importance of scavenging in 2-stroke engine?

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Explain Detonation in SI engine. What is the effect of detonation on combustion process?
Explain (i) Auto Ignition Theory (ii) Detonation Theory

Q.2 Draw p-θ diagram of SI engine combustion. What are the various factors that affect the second stage of combustion "Flame Propagation" in SI engine? Explain in detail.

Q.3 The engine of the Fiat car has four cylinders of 68mm bore 75mm stroke. The compression ratio is 8. Determine the cubic capacity of the engine and the clearance volume of each cylinder.

Q.4 What are various methods of supercharging of IC engine? Compare merits and demerits of supercharging in CI and SI engines.

Q.5 Draw and explain the construction and working of free piston engine.

7E1747

Roll No. _____ Total No. of Pages: 2

7E1747

B. Tech. VII - Sem. (Re Back) Exam., - 2024

Mechanical Engineering

7ME5-11 I. C. Engines

Time: 3 Hours **Maximum Marks: 120**

Min. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 What are the stages of combustion in a SI engines?

Q.2 Why smoke is formed in a CI engine?

Q.3 What is 4-stroke engine?

Q.4 What is an IC engine?

Q.5 What is the difference between 2-stroke and 4-stroke IC engine?

Q.6 Mention any two advantages of induction swirl.

Q.7 What is Ignition Lag?

Q.8 What is a heterogeneous air-fuel mixture?

Q.9 What is an indirect-injection type combustion chamber?

Q.10 What is Mechanical efficiency?

PART – B

[5×8=40]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain about the various types of combustion chambers of S.I. Engine with neat sketch.

Q.2 Discuss about the phenomena of Knock in S.I. & C.I. Engines.

Q.3 Explain CRDI.

Q.4 Explain various classification of an I.C. Engines.

Q.5 Discuss the effects of engine variables on combustion parameters.

Q.6 Discuss about the working of a 4 stroke petrol engine with neat sketch.

Q.7 Explain the construction and working of a Solex Carburetor with neat sketch.

PART – C

[4×15=60]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any four questions

Q.1 Explain the working of a 2 stroke petrol engine with neat sketch.

Q.2 Explain the working of a 4 stroke diesel engine with neat sketch.

Q.3 Define Carburetion and explain the construction and working of a simple carburetor with neat sketch.

Q.4 What is the use of Lubrication system in automobiles? Explain various types of lubrication systems with neat sketch.

Q.5 Explain the working of Battery coil ignition systems with neat sketch.

7E1749

Roll No. _____ Total No. of Pages: 3

7E1749

B. Tech. VII - Sem. (Re Back) Exam., - 2024

Mechanical Engineering

7ME5-13 Turbomachines

Time: 3 Hours **Maximum Marks: 120**

Min. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 What is scope of Turbomachine?

Q.2 What is slip factor?

Q.3 What is casing of Turbine?

Q.4 What are the advantages and disadvantages of centrifugal pump?

Q.5 What is power input factor?

Q.6 What is steady flow energy equation?

[40]

Q.7 What is performance curve?

Q.8 What is non-dimensional analysis?

Q.9 Write the name of all parts of single acting reciprocating pump.

Q.10 What is head co-efficient?

[5×8=40]

PART – B

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Derive the work done and reaction ratio for a free vortex blade.

Q.2 What do you understand by blade and stage efficiency? Derive an expression for blade efficiency.

Q.3 A centrifugal impeller has 17 radial blades in the impeller of 45 cm dia. the tip dia. of eye is 25 cm. Find slip factor.

Q.4 A turbine develop 7500 kW under a head of 24.7 m at 135 rpm. What is the specific speed? What would be its normal speed and output under a head 19.5 m.

Q.5 Explain the working of centrifugal pump also draw the sketch with their parts.

Q.6 Explain Newton's Second Law of motion. Why it's important for turbo machines?

Q.7 Draw a sketch of an axial flow compressor with inlet guide vane and also explain the working principle of compressor.

[40]

PART – C

[4×15=60]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any four questions

Q.1 Define Turbomachinery? Classify it. Also derive the Euler's equation for Turbomachinery.

Q.2 The stroke and bore of a cylinder reciprocally engine running of 70 rpm are 500 mm and 250 mm respectively. The 20 m long delivery pipe has a diameter of 80 mm. Determine the power saved by installing in an vessel in the delivery pipe. If pipe friction factor is 0.008.

Q.3 Derive the expression for specific work output and the efficiency of a simple cycle with reheat. Also derive their trends as a function of pressure ratio.

Q.4 Explain dimensional analysis applied to compressible flow machines and also explain mass flow rate parameter.

Q.5 An impeller of centrifugal pump having internal and external diameter are 150 mm and 300 mm. The vane angles of the impeller at inlet and outlet are 20° & 30° respectively. The pump is running at 1300 rpm. The water enter the impeller radially and velocity of flow is constant. Determine the work done by impeller per unit weight of water.

7E7011

Roll No. _____ Total No. of Pages: 3

7E7011

B. Tech. VII - Sem. (Old Back) Exam. - 2024

Mechanical Engineering

7ME1A Finite Element Methods

ME. PI

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 26

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT- I

Q.1 (a) Solve the following system of equation using the Gauss elimination method. [8]

$$x + y + z = 9$$

$$2x + 5y + 7z = 52$$

$$2x + y - z = 0$$

(b) Define the following terms - [8]

(i) Banded symmetric matrix

(ii) Global stiffness matrix

OR

Q.1 (a) Explain heat flux boundary conditions in one dimension. [4]

(b) Write short notes on the following - [12]

(i) Singular matrix

(ii) Properties of the stiffness matrix

(iii) Eigen value and Eigen vector

UNIT- II

Q.2 (a) Explain the steps involved in FEM. [8]

(b) Explain the principle of Minimum Potential Energy. [8]

OR

Q.2 (a) Write down the expressions for the element stiffness matrix and force vector of a Beam element. [8]

(b) Explain different approaches to getting the finite element equations and also explain the natural and geometric boundary conditions. [8]

UNIT- III

Q.3 (a) Explain plane stress and plane strain problems. [8]

(b) What do you understand by shape functions? What is the difference between the shape function and the weight function? [8]

OR

Q.3 Derive the strain displacement matrix and expression for the stiffness matrix of a CST element. [16]

UNIT- IV

Q.4 (a) Explain plane stress and plane strain problems. [8]

(b) Calculate the exact integral of cos x on the interval [-1, 1] and find the relative error if a Gauss 1, 2, 3 and 4 integration points scheme is used. [8]

OR

Q.4 Solve the differential equation for a physical problem expressed as $d^2y/dx^2 + 50 = 0, 0 \leq x \leq 10$ where boundary conditions as $y(0) = 0$ and $y(10) = 0$ using the trial function $y = a_1x\ (10 - x)$. Find the value of the parameters a_1 by the following methods. (i) Least squares method and (ii) Galerkin method (iii) Collocation method (iv) Sub-domain method. [16]

UNIT- V

Q.5 (a) Write brief notes on the following: - [8]

(i) Aspect ratio

(ii) Element continuity

(iii) Convergence of solution

(iv) Implicit Vs Explicit

(b) Write the advantages and applications of finite element methods. [8]

OR

Q.5 Consider a uniform cross-section bar fixed at one end of length L and area of cross-section A made up of a material whose Young's modulus and density are given by E and ρ. Estimate the natural frequencies of axial vibration of the bar using both consistent and lumped mass matrices. [16]

7E1811

Roll No. _____ Total No. of Pages: 2

7E1811

B. Tech. VII - Sem. (Main / Back) Exam., - 2024

Open Elective – I

7AG6-60.2 Environmental Engineering and Disaster Management

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 What is the importance of safe water supply?

Q.2 What are the standard of drinking water?

Q.3 What is solid waste?

Q.4 What are the different types of pollutions?

Q.5 What is disaster management?

Q.6 What do you mean by wastewater?

Q.7 Define chemical oxygen demand.

Q.8 Define total organic carbon.

Q.9 What are the physical & chemical parameter of the water quality?

Q.10 What are the different types of pollutant in wastewater?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 What is hardness? Define Dissolve oxygen and Biological oxygen demand.

Q.2 Why soiling and corrosion are hidden cost of air pollution? Explain.

Q.3 How do individual contaminants affects human health? Explain it.

Q.4 Differentiate between natural and man-made pollution with examples.

Q.5 Discuss the role of green house in disaster management.

Q.6 Explain term Air Pollution. Discuss the types of air pollutants which causes air pollutions.

Q.7 Write the different step involve in domestic wastewater treatment plant.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 What is landslide? What are the causes of landslide? Explain.

Q.2 Explain term deforestation. Discuss the factors promoting deforestation.

Q.3 Discuss the treatment methods of effluent domestic water, wastewater and industrial wastewater.

Q.4 What are the different BIS standard for pollutants in air? Explain it.

Q.5 Discuss manmade disaster due to lack of public awareness. Explain relationship between national security and disaster.

7E1711

Roll No. _____ Total No. of Pages: 3

7E1711

B. Tech. VII - Sem. (Re Back) Exam., - 2024

Open Elective – I

7AG6-60.2 Environmental Engineering and Disaster Management

Time: 3 Hours **Maximum Marks: 120**

Min. Passing Marks: 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 What is the objective of the Environmental Engineering?

Q.2 Why is a safe water supply system important for public health?

Q.3 What are the main differences in domestic water requirements between urban and rural areas?

Q.4 What are the key parameters used to access drinking water quality?

Q.5 State the importance of sanitation in maintaining public health and hygiene.

Q.6 What are the key characteristics of domestic wastewater?

Q.7 How does wastewater disposal differ in urban and rural areas?

Q.8 What are the key characteristics of solid waste in urban and rural areas?

Q.9 Define air pollution. Name two types of pollutants commonly found in urban air.

Q.10 What are the basic objectives of disaster management?

PART – B

[5×8=40]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Discuss the different sources of water supply. Explain the advantages and disadvantages of each source in urban and rural areas.

Q.2 Describe the process of intakes and transportation of water in a water supply system. How do these processes ensure safe and efficient water distribution?

Q.3 Explain the Indian Standards for drinking water (IS 10500:2012). What are the major quality parameters specified in these standards?

Q.4 Discuss the various types of sewers used in domestic wastewater system. Explain, how the design discharge is calculated for sewer systems in urban areas?

Q.5 Explain the concept of hydraulic design in sewerage systems. What factors must be considered to ensure sewer design?

Q.6 Discuss the methods of solid waste disposal in urban and rural areas. How do these methods differ and what are the environmental impacts of improper waste disposal?

Q.7 Describe the BIS standards for air quality. How do these standards help in controlling air pollution and protecting public health?

PART – C

[4×15=60]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any four questions

Q.1 Discuss the role of Environmental Engineering and Disaster Management in addressing global environmental challenges. How can the integration of disaster management principles into environmental engineering contribute to sustainable development and resilience against disasters?

Q.2 Explain the importance of designing a safe water supply system for urban and rural areas. Discuss the factors influencing domestic water requirements in these areas and the challenges faced in sourcing, intake and transportation of water. How can these challenges be mitigated?

Q.3 Describe the significance of drinking water quality in public health. Explain the Indian Standards for drinking water and how these standards guide the treatment processes. Discuss the role of sanitation in preventing waterborne diseases and promoting overall community health.

Q.4 Describe the process of domestic wastewater treatment. Discuss the primary, secondary and tertiary methods and explain their importance in treating wastewater.

Q.5 Explain the various types of disaster (natural and man-made). Discuss the significance of disaster management in minimizing the impact of these disaster. What role does preparedness, mitigation and response play in an effective disaster management strategy?

7E7012

Roll No. _____

Total No. of Pages: 4

7E7012

B. Tech. VII - Sem. (Old Back) Exam., - 2024

Mechanical Engineering

7ME2A Refrigeration and Air-Conditioning

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks: 26

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. Steam Table and Psychometric Charts
2. Refrigerant Table

UNIT- I

Q.1 (a) Define one tonne of refrigeration. Derive relationship between C.O.P. of refrigerator and heat pump working on reversed Carnot cycle and show the schematic diagram. [8]

(b) A cold storage is supplied with 4500 kg of fish at 25°C. The fish has to be cooled to -12°C. Freezing point of fish is -3°C. If the capacity of plant is 12 tons, how long it will take to cool the fish. Specific heat of fish above and below freezing point are 3 kJ/kg-K and 1.25 kJ/kg-K respectively latent heat of freezing = 230 kJ/kg-K. [8]

OR

Q.1 (a) A vapour compression refrigerator works between the pressure limits of 60 bar and 25 bar. The working fluid is just dry at the end of the compression and there is no under cooling of the liquid before the expansion valve. Determine the C.O.P. of the cycle and capacity of refrigerant if the fluid flow is at the rate of 5 kg/min. [8]

Pressure (bar)	Saturation Temp (K)	Enthalpy (kJ/kg)		Entropy (kJ/kg.K)	
		Liquid	Vapour	Liquid	Vapour
60	295	151.9	293.29	0.554	1.0332
25	261	266	322.58	0.226	1.2464

(b) Draw a schematic diagram of a refrigerating system having three evaporators at different temperatures with single compressor, multiple expansion valves and back pressure valves. Explain the working of this system with the help of p-h diagram. [8]

UNIT- II

Q.2 (a) Draw and explain the boot-strap evaporative type of air refrigeration system. [8]

(b) In a refrigeration plant working on reversed brayton cycle, air is compressed to 5 bar from 1 bar. Its initial temperature is 10°C. After compression, the air is cooled up to 20°C in a cooler before expanding back to pressure of 1 bar. Determine the theoretical C.O.P. of the plant and net refrigerating effect. Take C_P of air is 1.005 kJ/kg-K. [8]

OR

Q.2 (a) A dense air refrigeration cycle operates b/w pressure of 4 bar and 16 bar. The air temperature after heat rejection to surrounding is 38°C and air temperature at exit of the refrigerator is 7°C. The isentropic efficiency of the turbine and compressor are 0.85 & 0.8 respectively. Determine the compressor and turbine work/TR, C.O.P. and power/TR. Take γ=1.4 and C_P of air is 1.005 kJ/kg K. [8]

(b) Air is used as a refrigerant in Reversed Brayton Cycle. Draw T-S and P-V diagram for this cycle and derive the expression for C.O.P. in terms of pressure ratio (γ_p). [8]

[220]

UNIT- III

Q.3 (a) Explain with a neat sketch the working of lithium-bromide vapour absorption system. [8]

(b) Write the thermodynamic properties of a refrigerant. Give the chemical formula and names of the refrigerants R-22 and R-12. [8]

OR

Q.3 (a) Illuminate the working principle of Electrolux refrigeration system with the help of configuration diagram. [8]

(b) Draw a neat sketch of simple vapour absorption refrigeration system. Derive formula for C.O.P. of an ideal vapour absorption system. [8]

UNIT- IV

Q.4 (a) Write short note on the following - [4×2=8]

(i) Relative humidity
(ii) Specific humidity
(iii) Adiabatic saturation temperature
(iv) Dew point temperature

(b) The pressure and temperature of mixture of dry air and water vapour are 736 mm of Hg and 21°C. The dew point temperature of the mixture is 15°C. Find the following - [8]

(i) Partial pressure of water vapour in the mixture
(ii) Relative Humidity
(iii) Enthalpy of mixture
(iv) Specific volume of mixture per kg of dry air

OR

Q.4 (a) Explain Comfort chart with a suitable diagram. [8]

(b) Explain the following processes - [4×2=8]

(i) Sensible heating
(ii) Sensible cooling
(iii) Heating and Dehumidification
(iv) Cooling and Dehumidification

UNIT- V

Q.5 (a) Explain the term cooling load. Explain the method of estimating heat gain due to infiltration of air. [8]

(b) Explain the following - [8]

(i) ERSHF

(ii) GSHF

(iii) RSHF

(iv) Cooling load estimation

OR

Q.5 (a) A classroom of 60 seating capacity is air-conditioned. The outdoor conditions are 32°C DBT and 22°C WBT and the required conditions are 22°DBT and 55% R.H. The quantity of outdoor air supplied is 0.5 cmm per student. The conditions are achieved by chemical dehumidifying the air and then cooling by the cooling coil. Find the followings - [10]

(i) DBT of the sir leaving the dehumidifier

(ii) Capacity of the dehumidifier

(b) Explain summer air conditioning system for hot and dry outdoor condition system with sketch and represent the conditions on P-H chart. [6]
