R-13 **Code : 13CE2103**

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, APRIL 2021

II B.Tech. I Semester

BUILDING TECHNOLOGY

(Civil Engineering)

Time: 3 hours Max. Marks: 60

*Answer **FIVE** Questions, Choosing **ONE** Question from each section*
All Questions carry equal marks

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SECTION - I

1 (a) What are the characteristics of a good building stone?

(b) Discuss the process of manufacturing of bricks ?

2 (a) List out different methods of quarrying the stone and explain in detail any two methods.

(b) Discuss the process of manufacturing of tiles?

SECTION - II

3 (a) Explain the composition of cement?

(b) Enumerate the important ingredients used in concrete?

4 (a) Explain the functions of cement ingredients.

(b) Clearly write the various functions of sand?

SECTION - III

5 (a) Discuss various functions of foundations?

(b) List out the materials generally used for stone masonry and explain any one material in brief.

6 (a) Explain clearly the traditional and modular bricks with the help of neat sketches.

(b) Explain in detail the essential requirements of a floor.

SECTION - IV

7 (a) Explain the stone lintels with the help of neat sketch.

(b) Discuss various modes of failures of an arch and also write their remedies.

8 (a) Discuss the requirements of a good stair.

(b) Explain the importance of king-post truss with the help of neat sketch.

SECTION - V

9 (a) What are different types of mortars used for plastering and explain in detail any one mortar in brief.

(b) List out the constituents of a paint and also explain any two constituents in detail.

10 Explain various principles that should be kept in mind while designing a house drainage system.

R-13 **Code : 13EE2101**

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, APRIL 2021

II B.Tech. I Semester

ELECTROMAGNETIC FIELDS

(Electrical & Electronics Engineering)

Time : 3 hours Max. Marks :60

*Answer **FIVE** Questions, Choosing **ONE** Question from each section*
All Questions carry equal marks

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SECTION – I

1 (a) Eight identical point charges of Q C each are located at the corners of a cube of side length a, with one charge at the origin, and with the three nearest charges at (a, 0, 0), (0, a, 0), and (0, 0, a). Find an expression for the total vector force on the charge at P(a, a, a), assuming free space.

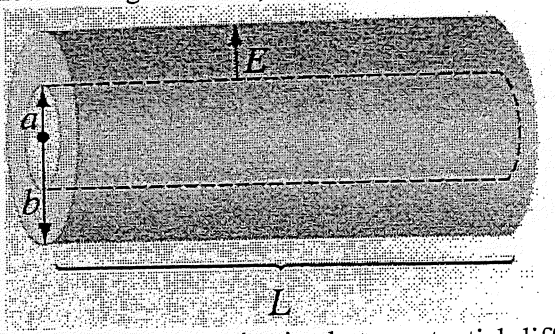
(b) A point charge of 3 nC is located at the point (1, 1, 1) in free space. What charge must be located at (1, 3, 2) to cause the y component of $\mathbf{E}$ to be zero at the origin?

2 (a) An electric field in free space is $\mathbf{E} = \frac{5z^3}{\epsilon_0}\widehat{a_z}$ V/m. Find the total charge contained within a sphere of 3-m radius, centred at the origin.

(b) Calculate the work done in moving a 4-C charge from B(1, 0, 0) to A(0, 2, 0) along the path y = 2 − 2x, z = 0 in the field E = (i) $5\boldsymbol{a_x}$V/m; (ii) $5x\boldsymbol{a_x}$V/m; (iii) $5x\boldsymbol{a_x} + 5y\boldsymbol{a_y}$V/m.

SECTION – II

3 (a) Two long coaxial metal cylinders (radii a and b) are separated by material of conductivity σ (as shown in Figure below), determine the field between the cylinders.



Referring to 3(a) above, if they are maintained at a potential difference V find what current flows from one to the other, in a length L?

(b) Find the relative permittivity of the dielectric material present in a parallel-plate capacitor if:
(i) S = 0.12 m^2, d = 80 μm, V_0 = 12 V, and the capacitor contains 1 μJ of energy;
(ii) the stored energy density is 100 J/m^3 , V_0 = 200 V, and d = 45 μm;
(iii) E = 200 kV/m and ρ_S = 20 μC/m^2 .

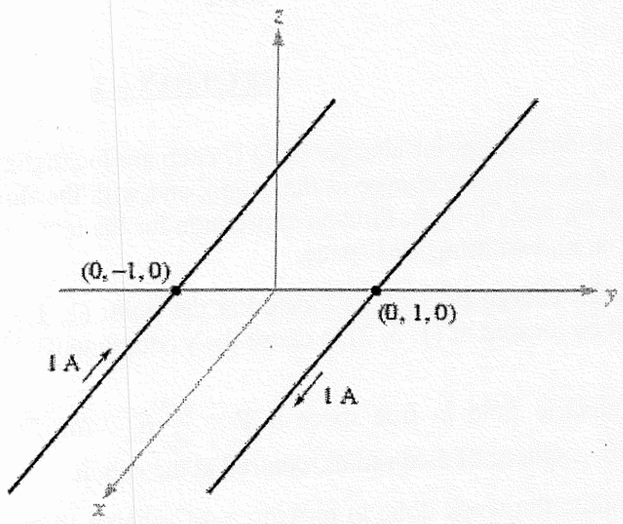
4 (a) The y-z plane is the boundary between two dielectrics of relative permittivities $\square_r=3$ and $\square_r=9$. For negative values of x, $E=\hat{x}5+\hat{y}$ V/m. Find the magnitude and direction of D for x>0.

(b) With reference to 4(a), draw a field line across the boundary.

SECTION – III

5 (a) Ampere's Circuital law.

(b) Two long parallel filamentary conductors shown in Figure lie in free space. Plot $|\mathbf{H}|$ versus y, $-4 < y < 4$, along the line $x = 0$, $z = 2$.



6 (a) Derive the expression for vector magnetic potential from Biot-Savarts's law.

(b) A filamentary conductor is formed into a square with sides of length ℓ carrying current I. Find the magnetic field intensity at the centre of the square.

SECTION – IV

7 (a) Calculate the self-inductances of and the mutual inductances between two coaxial solenoids of radius R_1 and R_2, $R_2 > R_1$, carrying currents I_1 and I_2 with n_1 and n_2 turns/m, respectively.

(b) Find the magnetization in a magnetic material where:
(i) $\mu = 1.8 \times 10^{-5}$ H/m and H = 120 A/m;
(ii) $\mu_r = 22$, there are 8.3×10^{28} atoms/m^3, and each atom has a dipole moment of 4.5×10^{-27} A · m^2;
(iii) B = 300 μT and $\chi_m = 15$.

8 (a) Drive an expression for energy stored in magnetic fields?

(b) Compare the magnitudes of the electric and magnetic forces on an electron that has attained a velocity of 10^7 m/s. Assume an electric field intensity of 10^5 V/m, and a magnetic flux density associated with that of the Earth's magnetic field in temperate latitudes, 0.5 Gauss.

SECTION – V

9 (a) Derive the expression for the motional electric field intensity Em.

(b) Within a certain region, $\epsilon = 10^{-11}$ F/m and $\mu = 10^{-5}$ H/m. If $B_x = 2 \times 10^{-4} \cos 10^5 t \sin 10^{-3} y$ (T):

(i) use $\nabla \times \mathbf{H} = \epsilon \partial E / \partial t$ to find E;

(ii) find the total magnetic flux passing through the surface $x = 0$, $0 < y < 40$ m, $0 < z < 2$ m, at $t = 1$ μs;

(iii) find the value of the closed line integral of E around the perimeter of the given surface.

10 (a) Derive the continuity equation from Maxwell's equations.

(b) Let $\mu = 10^{-5}$ H/m, $\epsilon = 4 \times 10^{-9}$ F/m, $\sigma = 0$, and $\rho v = 0$. Find k (including units) so that each of the following pairs of fields satisfies Maxwell's equations:
(i) $D = 6\mathbf{a_x} - 2y\mathbf{a_y} + 2z\mathbf{a_z}$ nC/m^2, $H = kx\mathbf{a_x} + 10y\mathbf{a_y} - 25z\mathbf{a_z}$ A/m;
(ii) $E = (20y - kt)\mathbf{a_x}$ V/m, $H = (y + 2 \times 10^6 t)\mathbf{a_z}$ A/m.

R-13 **Code : 13CE2106**

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, APRIL 2021

II B.Tech. I Semester

FLUID MECHANICS

(Mechanical Engineering)

Time : 3 hours Max. Marks :60

*Answer **FIVE** Questions, Choosing **ONE** Question from each section*
All Questions carry equal marks

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SECTION - I

1 (a) State and explain the Newton's law of viscosity?

(b) The space between two square flat parallel plates is filled with oil. Each side of the plate is 720 mm. The thickness of the oil film is 15 mm. The upper plate, which moves at 3 m/s requires a force of 120 N to maintain the speed. Determine:
(i) The dynamic viscosity of the oil
(ii) The kinematic viscosity of oil if the specific gravity of oil is 0.95.

2 (a) What is the difference between cohesion and adhesion?

(b) A single column U-tube manometer, made of glass tubing a nominal inside diameter of 2.4 mm, has been used to measure pressure in a pipe or vessel containing air. If the limb opened to atmosphere is 10 percent oversize, find the error in mm of mercury in the measurement of air pressure due to surface tension effects. It is stated that mercury is the manometric fluid for which surface tension $\sigma = 0.52$ N/m and angle of contact $\alpha = 140^0$.

SECTION - II

3 (a) State and prove 'Pascal's Law'.

(b) The diameters of ram and plunger of an hydraulic press are 200 mm and 30 mm respectively. Find the weight lifted by the hydraulic press when the force applied at the plunger is 400N.

4 A triangular plate of 1m base and 1.5 m altitude is immersed in water. The plane of the plate is inclined at 30^0 with water surface while the base is parallel to and a depth of 2m from the water surface. Calculate:
(i) The total pressure on the plate, and
(ii) The position of the centre of pressure.

SECTION – III

5 (a) How is the continuity equation based on the principle of conservation of mass stated.

(b) Find the velocity and acceleration at a point (1, 2, 3) after 1 sec, for a three dimensional flow given by $u = yz + t$, $v = xz - t$, $w = xy$ m/s

6 Water is flowing through a pipe having diameters 600 mm and 400 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 350 kN/m^2 and the pressure at the upper end is 100 kN/m^2. Determine the difference in datum head if the rate of flow through the pipe is 60 litres/sec.

SECTION – IV

7 (a) Explain Piezometer and U-tube manometer.

(b) A U-tube mercury differential manometer has been used to measure the pressure differential across the inlet and throat of a venturimeter that conveys water. Calculate the pressure difference when (i) venturimeter is laid horizontally and the manometer reads 25 cm (ii) venturimeter is laid vertically, the inlet lies 20 cm above the throat and the manometer reads 10 cm.

8 An external cylindrical mouth piece of diameter 120 mm is discharging water under a constant head of 6 m. If C_c for vena-contracta = 0.62. C_d=0.86 and atmospheric pressure head = 10.3 m of water. Find:
(i) Discharge through the mouth piece, and
(ii) Absolute pressure head of water at vena-contracta.

SECTION – V

9 Oil of specific gravity 0.82 is pumped through a horizontal pipe line 15 cm diameter and 3 km long at the rate of 900 litres per minute. This pump has an efficiency of 68% and requires 7.35 kW to pump the oil. Determine the dynamic viscosity of oil and verify whether the flow is laminar.

10 A pipe 5 cm diameter is 5 m long and carries a discharge of 0.005 m^3/s.
(i) Find the loss of head due to friction.
(ii) The central 2 m length of pipe is next replaced by a pipe 7.5 cm diameter. The changes of section being sudden. Determine the loss of head and corresponding power due to adoption of this alternative.

Take friction coefficient = 0.01 for the pipe of both diameters and contraction loss coefficient = 0.5.

R-13

Code : 13EC2103

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, APRIL 2021

II B.Tech. I Semester

ELECTROMAGNETIC FIELDS & WAVES

(Electronics & Communication Engineering)

Time : 3 hours Max. Marks : 60

*Answer **FIVE** Questions, Choosing **ONE** Question from each section*
All Questions carry equal marks

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SECTION - I

1 (a) Discuss any three applications Gauss's law.

(b) Evaluate Electric field E at a point P(0,0,h) due to a circular ring of radius "a" carries a uniform charge ρ_l C/m and assume it is placed on the xy-plane with axes the same as the z-axes and also obtain the value of h at which the electric field is maximum. If the total charge on the ring is Q, then find E as "a" tends to zero.

2 (a) Define potential gradient? How it is related with electric field E? explain.

(b) Determine the electric field intensity and electric flux density inside (r<a) and outside (r>a) the spherical charge of radius of r=a. Draw the graph of magnitude of electric flux density vs radius r.

SECTION - II

3 (a) Define dipole and dipole moment.

(b) Calculate the total charge inside each of the volume indicated
(i)$\rho_v = 10\, z^2\, e^{-0.1x}\, \mathrm{Sin}(\pi y)$, $-1 \le x \le 2$, $0 \le y \le 1$, $3 \le z \le 3.6$
(ii)$\rho_v = 4xyz^2$, $0 \le \rho \le 2$, $0 \le \phi \le \pi/2$, $0 \le z \le 3$
(iii) $\rho_v = \dfrac{3\pi Cos^2\theta Cos^2\phi}{2r^2(r^2+1)}$

4 (a) Analyze the Maxwell's equations of electrostatic fields.

(b) Evaluate the capacitance of a spherical capacitor with a = 1.5 cm and b = 4 cm has non-homogeneous dielectrics of $\varepsilon = \dfrac{10\varepsilon_o}{r}$.

SECTION - III

5 (a) Analyze the magnetic energy and magnetic energy density with suitable equations

(b) Determine the magnetic flux density B, given that the magnetic vector potential in the magnetic field region A = $-\rho^2/4\, a_z$ Wb/m and also obtain the total magnetic flux crossing the surface $\phi = \pi/2$, $1 \le \rho \le 2$m, $0 \le z \le 5$m.

6 (a) Analyze the inconsistency of Ampere's law.

(b) Apply Maxwell's equations and obtain the magnetic field intensity H and the constant β in a medium characterized by $\sigma = 0$, $\mu = \mu_o$, $\varepsilon = \varepsilon_0$ having the electric field $E = 20\ \mathrm{Sin}(10^8 t - \beta z) a_y$ V/m.

SECTION - IV

7 (a) Summarize the wave propagation parameters, attenuation constant, Phase constant and Propagation constant.

(b) Evaluate Phase constant, Loss Tangent, Intrinsic Impedance, Wave velocity and H field, when a plane wave is propagating through a medium with $\varepsilon_r = 8$, $\mu_r = 2$, Electric field $E = 0.5e^{-z/3} Sin(10^8 t - \beta z) a_x V/m$.

8 (a) Determine Poynting vector for lossy dielectrics.

(b) Evaluate the intrinsic impedance, Poynting vector and the time average power crossing the surface x=1, 0<y<2, 0<z<3 m in a nonmagnetic material $H = 30Cos(2\pi X 10^8 t - 6x) a_y mA/m$

SECTION - V

9 (a) Define Critical angle and Brewster angle.

(b) Use incident, reflected and transmitted wave equations to obtain the Brewster angle for parallel polarization of oblique incidence.

10 (a) Analyze the reflection of a plane wave at normal incidence.

(b) Solve incident, reflected and transmitted wave equations under the parallel polarization of oblique incidence to obtain reflection coefficient(Γ) and transmission coefficient(τ).

R-13 **Code : 13CS2104**

B.TECH. DEGREE SUPPLEMENTARY EXAMINATION, APRIL 2021

II B.Tech. I Semester

ADVANCED DATA STRUCTURES
(Computer Science & Engineering)

Time : 3 hours Max. Marks :60

*Answer **FIVE** Questions, Choosing **ONE** Question from each section*
All Questions carry equal marks

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SECTION - I

1 (a) Define Data Structure. List out differences between Single linked list and Circular linked List.

(b) What is List ADT? Discuss the insertion and deletion operations on a list using linked list implementation.

2 (a) Explain the advantages of doubly linked list over single linked list.

(b) Explain concatenation of single linked lists.

SECTION - II

3 (a) What is a Stack? Discuss the implementation of stacks using arrays.

(b) Obtain the postfix expression for the given infix expression below.
(A+B)^C-(D*E)/F

4 (a) Explain applications of priority queues.

(b) Explain operations of circular queue.

SECTION - III

5 (a) Construct a binary tree by using the following information with neat diagram.
Preorder: A B D I E H J C F K L G M
In order: D I B H J E A F L C K G M

(b) Discuss the Properties of a binary tree.

6 Construct the Binary Search tree for the following elements: 55, 36, 66, 33, 79, 96, 110, 49, 51, 56, 69, 38. Traverse the tree in in-order and post-order.

SECTION - IV

7 Define AVL Tree. Discuss the insertion and deletion operations on an AVL Tree with an example.

8 (a) Explain bottom-up splay tree?

(b) Explain the properties of Red-Black trees with appropriate example.

SECTION - V

9 (a) Explain the model for external sorting?

(b) Discuss the poly phase merge with an example.

10 (a) Explain heap sort with an example.

(b) Explain shell sort with an example.