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(Pages : 3)

Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2017

Third Semester

Branch : Electrical and Electronics Engineering

ELECTROMAGNETIC THEORY (E)

(Old Scheme—Prior to 2010 Admissions)

[Mercy Chance]

Time : Three Hours

Maximum : 100 Marks

Part A

*Answer all questions.
Each question carries 4 marks.*

1. State and explain Gauss's law and its applications.
2. The co-ordinates of a point in the rectangular co-ordinate system is (1, 2, 3). Find the position vector in cylindrical and spherical co-ordinate systems.
3. Explain electric dipole moment.
4. Derive an expression for the potential due to an infinite line charge.
5. Derive an expression for the capacitance between coaxial cylinders.
6. Derive an expression describing polarization ellipse. Explain its significance.
7. Derive an expression for the energy stored in a magnetic field.
8. State and explain the boundary conditions between two magnetic materials with different permeabilities.
9. State Maxwell's equations in integral form.
10. Explain how Faraday's law can be used to extend one of the Maxwell's equation from static to time varying electromagnetic fields.

(10 × 4 = 40 marks)

Part B

*Answer all questions.
Each full question carries 12 marks.*

11. Prove the divergence theorem for the data $\bar{D} = (x^2 - yz)\hat{a}_x + (z^2 - xz)\hat{a}_y + (y^2 - xy)\hat{a}_z$, for a rectangular parallelepiped bounded by the origin $0 \leq x \leq a, 0 \leq y \leq b, 0 \leq z \leq c$.

Or

Turn over

12. (a) Derive the expression for the electric field due to infinite sheet of charge density of $\rho_s C/m^2$.
(6 marks)
- (b) Calculate the force on a point charge of $50 \mu C$ placed at a point $(0, 0, 5)$ m due to a charge of $500 \mu C$ that is uniformly distributed over a circular disc of radius 5 m and placed in the xy -plane.
(6 marks)

13. Calculate the electric potential due to a spherical shell of radius 2 m and charge $6 \mu C$ at a point :
- 50 cm from the centre.
 - On the shell and
 - 4 m away from the shell.

Or

14. (a) Derive Laplace's equation and show that the potential field given by the equation :
 $V = 2x^2 - 3y^2 + z^2$ satisfies the Laplace's equation.
(7 marks)
- (b) If an electric potential is given by :
 $V = \frac{10}{r^2} \sin \theta \cos \phi$, find \bar{D} at $P\left(2, \frac{\pi}{2}, 0\right)$.
(5 marks)

15. (a) Derive the expression for capacitance of composite parallel plate capacitor. (6 marks)
- (b) Given $\bar{J} = 10^4 \sin \theta \hat{a}_r, A/m^2$ in spherical form. Calculate the current passing the spherical shell of $r = 0.02$ m.
(6 marks)

Or

16. (a) Obtain the conditions at the boundary between two dielectrics with different properties.
(6 marks)
- (b) The space between spherical conducting shells $r = 5$ cm and $r = 10$ cm is filled with a dielectric material for which $\epsilon = 2.25 \epsilon_0$. The two shells are maintained at a potential difference of 80 V.
(i) Find the capacitance of the systems and (ii) calculate the charge density on shell $r = 5$ cm.
(3 + 3 = 6 marks)

17. (a) Explain the concept of vector magnetic potential. (5 marks)
- (b) Calculate the reluctance of the magnetic circuit of mean length 0.5 m of area of cross-section 0.3 cm^2 . The relative permeability of the medium is 100. Also calculate the flux if the coil used to set-up the magnetic flux has 1000 turns with a current of 0.2 A.
(7 marks)

Or

18. (a) State and explain Biot-Savart law. (5 marks)
- (b) An infinitely long straight wire carrying 200 A, and in its vicinity a circular loop of 50 mm diameter is located with the centre of the loop 0.5 m away from the straight conductor, the wire and loop are coplanar. The current in the loop and the wire are such that they produce fields opposing each other. For what value of current in the loop will the B field at its centre be zero?
(7 marks)
19. (a) Obtain the relationship between electric field intensity and magnetic field intensity for uniform plane wave. (7 marks)
- (b) A capacitor has a capacitance of 1.5 pF. Find the displacement current at $t = 0$, if a voltage of $5 \sin(200 \pi t)$ is applied to it.
(5 marks)

Or

20. (a) Obtain an expression for the Poynting vector of a uniform plane wave travelling in free space. (7 marks)
- (b) Find the frequency at which the conduction current density and displacement current density are equal in a medium where $\sigma = 2 \times 10^{-4} \text{ S/m}$ and $\epsilon_r = 81$.
(5 marks)

[5 × 12 = 60 marks]

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Reg. No.....

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B.TECH. DEGREE EXAMINATION, NOVEMBER 2017

Third Semester

Branch : Electrical and Electronics Engineering

EE 010 306—MECHANICAL TECHNOLOGY [EE]

(New Scheme—2010 Admission onwards)

[Supplementary]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.

Each question carries 3 marks.

1. Write a short note on Metacentric Height of a floating body.
2. What are the different devices to measure the velocity of fluid ?
3. Explain the need of a draft tube in a turbine.
4. Explain the working of a hydraulic Ram.
5. Explain the term cavitation.

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. Derive an expression for capillary rise of water in a capillary tube.
7. Explain the working of Rotameter.
8. What are the advantages and disadvantages of francis turbine over a pelton wheel ?
9. What are different types of casing used in dynamic pumps ?
10. Explain the performance curves of a reciprocating pump.

(5 × 5 = 25 marks)

Turn over

Part C*Answer all questions.**Each question carries 12 marks.*

11. A circular plate 1.5m diameter is submerged in water with its greatest and least depths below the surface being 2m and 0.75m respectively. Determine :

- (a) Total pressure on one face of plate,
- (b) The position of centre of pressure.

Or

12. A vertical cylinder of diameter 180mm rotates concentrically inside another cylinder of diameter 181.2mm. Both cylinders are 300mm high. The space between the cylinders is filled with a liquid whose viscosity is unknown. Determine the viscosity of fluid in poise, if a torque of 20 Nm is required to rotate the inner cylinder at 120 rpm.

13. A 300mm x 150mm venturimeter is provided in a vertical pipe line carrying oil of specific gravity 0.9 flow being upward. The difference in elevation of throat section and entrance section of venturimeter is 300mm. The differential U tube mercury manometer shows a gauge deflection of 250mm. Calculate :

- (a) Discharge of oil,
- (b) Pressure difference between entrance section and throat section.

Or

14. In a pipe of 300mm diameter and 800m length an oil of specific gravity 0.8 is flowing at a rate of $0.45 \text{ m}^3/\text{sec}$ find :

- (a) Head loss due to friction and
- (b) Power required to maintain the flow.

15. Classify hydraulic turbine according to :

- (a) Head, action of water, direction of flow and specific speed.

(7 marks)

- (b) Where are the important Pelton turbine installations in India ?

Or

(5 marks)

16. Explain the performance characteristics of Hydraulic Turbine.

17. (a) What are the advantages of multi stage pumps over single stage pump ?

(7 marks)

(b) Explain the ISO efficiency characteristics of centrifugal pump.

(5 marks)

Or

18. What is specific speed of pump ? Derive an expression for specific speed of a pump, classify the pump based on specific speed of pump.

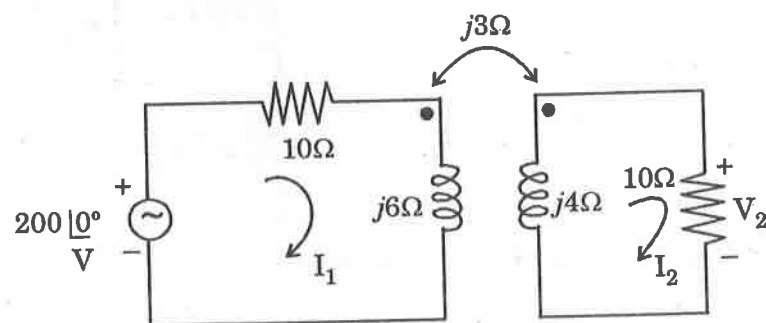
19. Explain the working of Reciprocating pump fitted with air vessel. Draw the Indicator diagram of Reciprocating pump fitted with air vessel.

Or

20. Explain with neat sketch, the working of Gearpump and root pumps.

[5 × 12 = 60 marks]

16. With the help of example, discuss in detail about loop matrix and cut set matrix.
17. (a) Two identical coupled coils in series has an equivalent inductance values of 0.084 H and 0.0354 H. Find the values of L_1 , L_2 , M and K .
- (b) In the circuit find the phasor voltage V_2 .



Or

18. Realize the following R_C driving point impedance function in (a) First Foster form ; (b) First Cauer form.

$$Z(s) = \frac{s^2 + 6s + 8}{s^2 + 4s + 3}$$

19. Determine the line currents for the unbalanced delta connected load consisting of $Z_{RY} = (30 + j40)$ ohm, $Z_{YB} = (8 + j4)$ and $Z_{BR} = (15 + j12)$ ohm. Assume the phase sequence to be RYB, $E = 200$ volts.

Or

20. A wye load with $Z_A = 3 + j0$, $Z_B = 2 + j3$, $Z_C = 2 - j1$ ohms is connected to a 3 phase, 4 wire, 100 volts, CBA system. Find the currents in all the four lines.

(5 × 12 = 60 marks)

B.TECH. DEGREE EXAMINATION, NOVEMBER 2017

Third Semester

Branch : Electrical and Electronics Engineering
 EE 010 303—ELECTRIC CIRCUIT THEORY (EE)
 (New Scheme—2010 Admission onwards)
 [Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.
 Each question carries 3 marks.

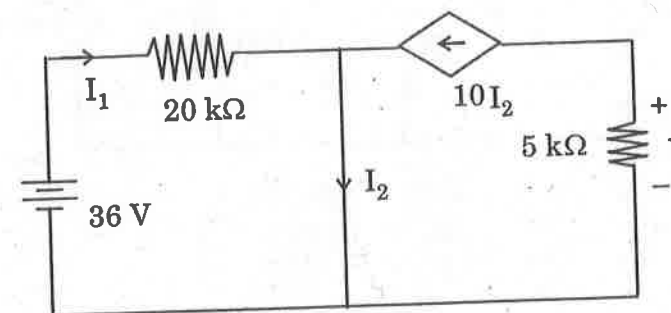
1. What are the limitations of Thevenin's and Norton's Theorem ?
2. The current in a resistive-inductive circuit is given as $i(t) = -5e^{-10t}$. Find (a) Time Constant ; (ii) $i(t)$ at $t = 0.4$ sec ; and (iii) Initial value of inductor current.
3. What are the properties of a graph of a circuit ?
4. What is Hurwitz Polynomial ?
5. Discuss about unbalanced loads.

(5 × 3 = 15 marks)

Part B

Answer all questions.
 Each question carries 5 marks.

6. Calculate the V in the circuit.



Turn over

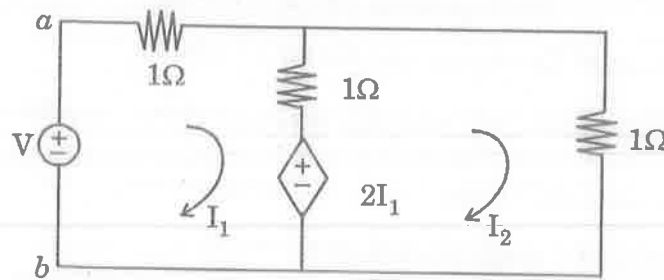
7. A d.c. voltage of 200 V is suddenly applied to a series L – R circuit having $R = 20 \Omega$ and $L = 0.2 \text{ H}$. Determine the voltage drop across the inductor at the instant of switching on and 0.02 sec later.
8. Obtain the properties of tree and loop of a graph.
9. With help of example explain dot rule.
10. How do you measure three-phase power by two wattmeter method ?

(5 × 5 = 25 marks)

Part C

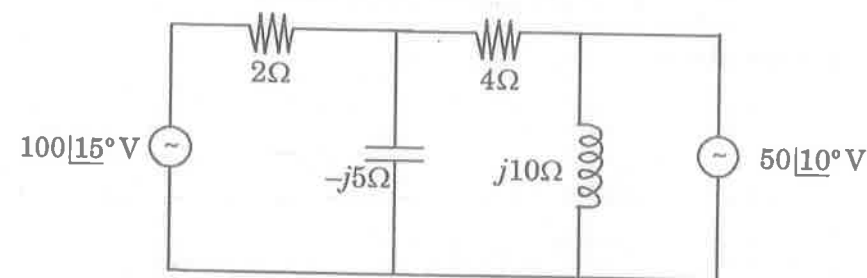
Answer all questions.
Each full question carries 12 marks.

11. Find the Thevenin's equivalent for the network shown in figure at the right of terminals $a - b$ and hence find the source current.

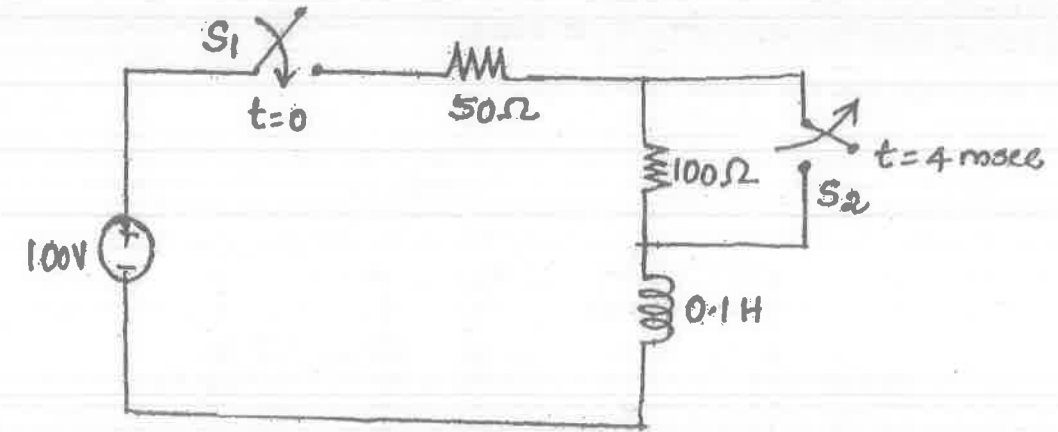


Or

12. Find the current through the capacitor and voltage across 4Ω resistance of the a.c. network shown in figure by using Superposition Theorem.

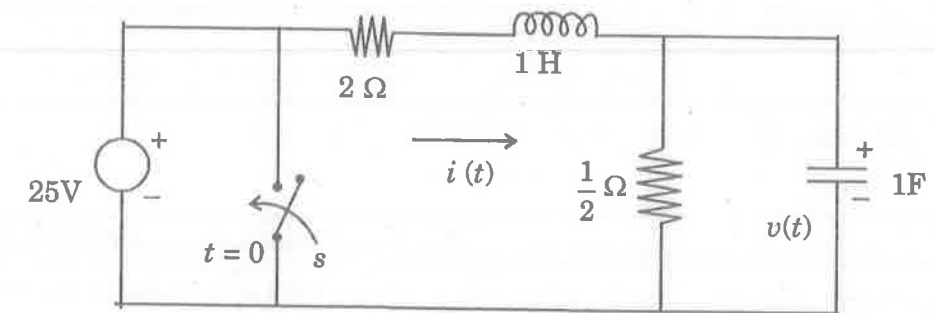


13. In the circuit of figure, s_1 is closed at $t = 0$ and s_2 is opened at $t = 4 \text{ msec}$. Determine $i(t)$ for $t > 0$. (Assume inductor is initially de-energised).

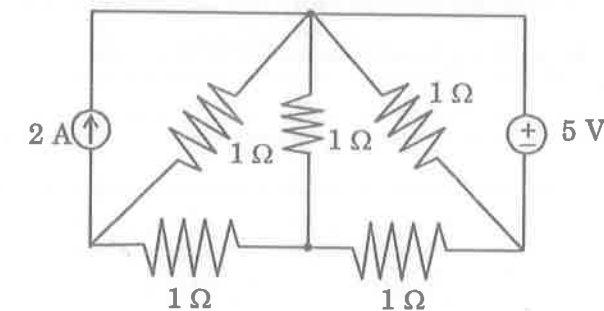


Or

14. In the circuit shown in figure, steady state is reached with s open s is closed at $t = 0$. Determine $i(t)$ and $v(t)$ for $t > 0$.



15. For the network shown in figure, draw the graph, write the tie set schedule and hence obtain the equilibrium equations on loop basis. Calculate the values of branch currents and branch voltages.



Or