F 4797 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Branch : Electrical and Electronics Engineering

ELECTRICAL AND ELECTRONIC MEASUREMENTS (E)

(Old Scheme – Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 4 *marks.*

1. What are the four intrinsic constants of a galvanometer?
2. Explain, why overdamping is not used in galvanometers?
3. What is the principle of working of a vernier potentiometer?
4. What do you mean by low, medium and high resistances?
5. Explain the merits and demerits of Anderson's bridge.
6. Sketch the Maxwell's inductance bridge and write the expression for unknown inductance.
7. Draw the circuit diagram and phasor diagram of a current transformer.
8. Calculate the percentage relative error of a volt meter, if the voltage measured by it is 12.12 volt when a 12 volt is applied?
9. How thermocouple gauges are industrially adopted?
10. What is Seebeck effect? How it generates thermo e.m.f.?

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*

Each full question carries 12 *marks.*

11. Explain the operation of a moving coil galvanometer. Derive the expression for the deflection θ.

Or

12. Describe the Lloyd-Fischer square for the measurement of iron losses in a specimen of laminations. How is the true value of flux density in the lamination determined.

Turn over

13. How the limitations of ordinary potentiometers are eliminated through a vernier potentiometer? Describe the circuit of a vernier potentiometer and explain how it is possible to measure as low voltage as 0.1 mV.

Or

14. (a) Simple slide wire is used for measurement of current in a circuit. The voltage across a standard resistance of 1 Ω is balanced at 75 cm. Find the magnitude of the current if the standard cell having an e.m.f. of 1.45 volts is balanced at 50 cm.

(b) With neat circuit diagram, describe the measurement of voltage in a precision slide wire potentiometer.

(5 + 7 = 12 marks)

15. A sheet of bakelite 4.5 mm thick is tested at 50 Hz between electrodes 0.12 m in diameter. The Schering bridge employs a standard air - capacitor C_2 of 106 pF, a standard non-inductive resistance R_4 of $\frac{1000}{\pi}$ Ω in parallel with a variable capacitor C_4 and a non-inductive variable resistance R_3. Balance is obtained with $C_4 = 0.5$ μF and $R_3 = 260$ Ω. Calculate the capacitance, power factor and relative permittivity of the sheet.

Or

16. With neat diagrams, explain how Wien's bridge can be used for experimental determination of frequency. Derive the expression for frequency in terms of bridge parameters.

17. A 100/5 A current transformer at its rated load of 20 VA, has an iron loss of 0.18 W and a magnetising current of 1.4 A. It is supplying rated output to a meter having a ratio reactance of 4. Calculate : (i) Ratio error ; and (ii) Phase angle. Also derive the expression for the actual current ratio.

Or

18. With neat sketches, explain the construction and working of potential transformer. What are the sources of error in it?

19. With neat sketches, explain the Lumer Brodhern type meters and their working principle.

Or

20. Describe the basic principle of a thermocouple. Explain with neat sketches, the constructional details and characteristics of any *two* types.

(5 × 12 = 60 marks)

F 4763 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Branch : Electrical and Electronics Engineering

EE 010 306—MECHANICAL TECHNOLOGY (EE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Define surface tension for a liquid.
2. What is a orificemeter ? Sketch a standard orificemeter.
3. Define various efficiencies for impulse and reaction turbine.
4. Define manometric efficiency.
5. What is "slip" in a reciprocating pump ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. What is a manometer ? How they are classified ?
7. Briefly explain the different forces present in a fluid flow.
8. How will you classify the turbines ?
9. Differentiate between volute casing and vortex casing of the centrifugal pump.
10. Define percentage slip and negative slip of a reciprocating pump.

(5 × 5 = 25 marks)

Part C

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

11. What do you understand by the hydrostatic equation ? With the help of this equation, derive the expression for the buoyant force acting on a submerged body.

Or

12. Derive an expression for the relation between gauge pressure P inside a droplet of liquid and the surface tension.

Turn over

13. What are the different forms of energy in a flowing fluid ? Represent schematically the Bernoulli's equation for flow through a tapering pipe and show the position of total energy line and the datum line.

Or

14. Show that the head lost due to friction is equal to one-third of the total head at inlet for maximum power transmission through pipes or nozzles.

15. Describe briefly the function of various main components of pelton turbine with neat sketches.

Or

16. What factors decide whether Kaplan, Francis or a pelton type turbine would be used in a hydroelectric project ? What is the significance of specific speed of a turbine ?

17. Discuss the effect of vapour pressure on lifting of liquid in a centrifugal pump.

Or

18. Obtain an expression for the work done by impeller of a centrifugal pump on water per second per unit weight of water.

19. Show from first principle that the work saved against friction in the delivery pipe of a single-acting reciprocating pump, by fitting an air vessel is 84.8% while for a double-acting reciprocating pump the work saved is only 39.2%.

Or

20. Discuss the effect of acceleration of the piston on the velocity and acceleration of the water in suction and delivery pipes of a positive displacement pump.

(5 × 12 = 60 marks)

F 4740 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Branch : Electrical and Electronics Engineering

EE 010 304—ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS (EE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. The best operating conditions are obtained with the meter that is either critically damped or slightly underdamped. Why ?
2. List the merits and demerits of Maxwell's bridge.
3. Describe the special features incorporated in electrodynamometer type wattmeter so that it can be used for low power applications.
4. Explain what will happen when the secondary circuit of a current transformer is opened while the primary is energized.
5. What are Lissajous figures ? What are its applications ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. What are the types of damping provided in an indicating instrument ? Explain electromagnetic damping.
7. In a Wheatstone bridge P-S and Q-R are opposite arms and PQSR in clockwise direction. The values of resistances are P = 1 kΩ, R = 1 kΩ, S = 5 kΩ and G = 100 Ω. The Thevenin source generator voltage E_0 = 24 mV and the galvanometer current is 13.6 μA. Calculate the value of the arm Q.
8. What are the difficulties in the measurement of high resistance ? Explain.
9. Explain the method of calibration of a single-phase energymeter using a standard wattmeter.
10. Explain the method of measurement of permeability.

(5 × 5 = 25 marks)

Turn over

Part C

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

11. Explain using neat diagrams, the construction and working of attraction type moving iron instruments. Discuss different methods to provide controlling and damping torques in them.

Or

12. (a) Describe the different types of supports used in electromechanical indicating instruments. Explain the significance of torque-to-weight ratio. (9 marks)

(b) Compare spring and gravity control mechanisms used in indicating instruments. (3 marks)

13. (a) Explain with relevant connection diagrams any one method of standardization of a.c. potentiometer. What are its applications ?

(7 marks)

(b) Explain, what is the condition to get maximum sensitivity for a Wheatstone bridge.

(5 marks)

Or

14. Using neat diagram of a bridge circuit, explain the methods of measuring capacitance and loss angle.

15. Explain the construction and working principle of a three-phase energy meter.

Or

16. With neat diagram, describe the construction and working of electrodynamometer wattmeter.

17. Derive the expression for transformation ratio and phase angle of a current transformer using its equivalent circuit and phasor diagram.

Or

18. With a neat circuit diagram, describe how a wattmeter is calibrated using a.c. potentiometer.

19. With a neat block diagram, explain the working of a dual-channel CRO ? Describe the function of each electrode in it.

Or

20. (a) Describe how the true value of flux density in a specimen of lamination is determined.

(5 marks)

(b) Describe, with necessary diagrams, the principle of operation of an a.c. voltmeter using rectifiers.

(7 marks)

[5 × 12 = 60 marks]

19. A 400 V, 3-phase balanced source is connected to an unbalanced mesh connected impedances of $Z\,ab = 10\angle 45°\,\Omega$, $Z\,bc = 10\angle 0°\,\Omega$, and $Z\,ca = 10\angle -45°\,\Omega$. Determine the line currents and total power.

Or

20. Derive the equation for power flowing into an unbalanced three-phase load in terms of the symmetrical components of voltages and currents.

(5 × 12 = 60 marks)

F 4730 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Branch : Electrical and Electronics Engineering

EE 010 303—ELECTRIC CIRCUIT THEORY (EE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. State and explain reciprocity theorem.
2. What is meant by Natural and Forced response ?
3. What is a cut-set schedule of a graph ?
4. Explain Dot convention of mutually coupled circuits.
5. What are the various 3-phase connections ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each full question carries 5 *marks.*

6. Explain how sources are classified ? Give examples.
7. What is meant by time constant ? Explain its significance.
8. Explain the advantages of circuit simulation using PSPICE.
9. What is meant by single tuned and doubled tuned circuits ?
10. Explain what is meant by sequence impedances.

(5 × 5 = 25 marks)

Part C

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

11. Find the power supplied by the 150 V source in the circuit using mesh analysis.

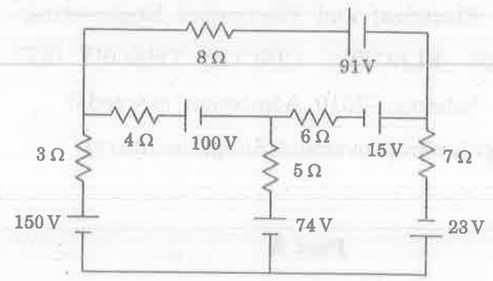


Fig. 1

Or

12. A loud speaker is connected across A and B of the circuit shown below Fig. 2. What should be the impedance of the speaker to obtain maximum power transfer and what is the maximum power ?

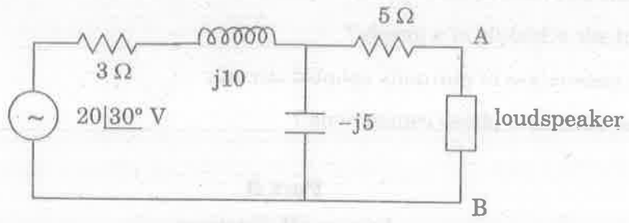


Fig. 2

13. In the network shown Fig. 3 the switch is on position 1 at $t = 0$ and after 200 m sec it is moved to position 2. Find the expression for the current through the capacitor.

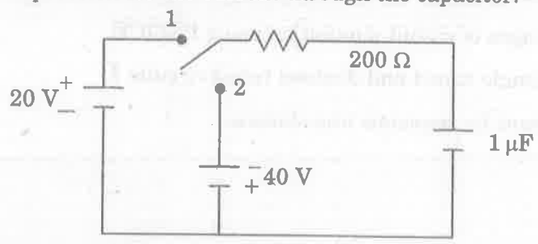


Fig. 3

Or

14. A 50 Hz 300 V (peak value) sinusoidal voltage is applied at $t = 0$ to a series RL circuits having R = 2.5 Ω and L = 0.1 H. Find the expression for the current. Find the current 0.01 sec after switching on.

15. Write the matrix loop equation for the network shown in Fig. 4 using loop analysis. Use Graph theory.

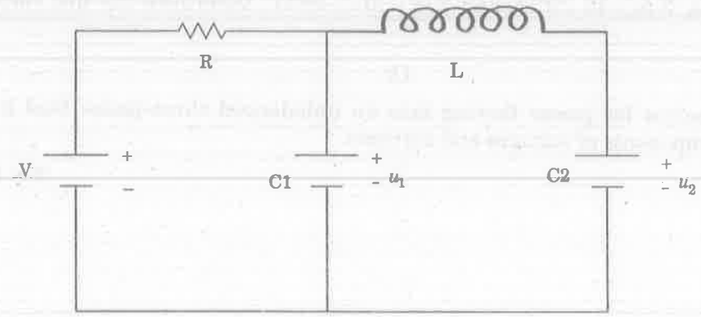


Fig. 4

Or

16. Write a PSPICE program for the circuit shown to determine the voltages of all nodes and the power dissipation of all source.

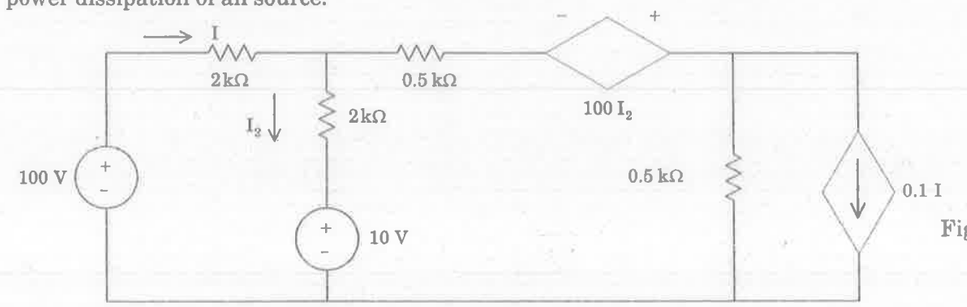


Fig. 5

17. Find the current in 5 Ω resistance in the coupled circuit shown Fig. 6 :

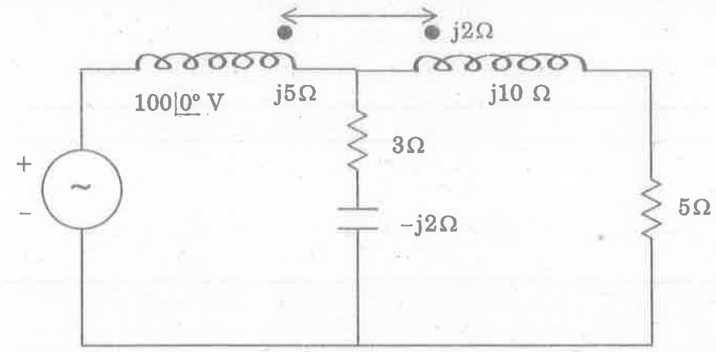


Fig. 6

Or

18. What are the properties of Positive Real function ? Determine whether the function is positive real or not :

$$Z(s) = \frac{2s^2 + 5}{s(s^2 + 1)}.$$

F 4752 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Branch :Electrical and Electronics Engineering

EE 010 305—ELECTRONIC CIRCUITS (EE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary)

Time : Three Hours Maximum :100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 marks.

1. Write the advantages and disadvantages of the collector-to-base bias.
2. What is the effect of source resistance on the voltage gain of a common base amplifier ?
3. Give reasons for the potential instability in tuned amplifiers.
4. Explain why positive feedback and not the negative feedback is necessary to produce oscillations.
5. Why is it possible to operate a monostable multivibrator for pulse stretching application ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 marks.

6. In a transistor amplifier, a charge of 0.025 V in signal voltage causes base current to change by 15 μA and collector current by 1.2 mA. If collector and load resistance are of 6 kΩ and 12 kΩ, determine (i) R_i ; (ii) A_v ; (iii) A_i ; (iv) A_p ; (v) a.c. load.
7. With neat sketches, show how h_{ib}, h_{ob} and h_{rb} are estimated from the transistor characteristics.
8. Explain cross-over distortion, its causes and remedy. What penalty is paid for biasing an amplifier into class AB operation ?
9. Differentiate between positive and negative feedback. Explain how does the negative feedback modify the gain of an amplifier ?
10. Design the circuit of a series Pass voltage regulator to generate V_o = 6 volt, $I_{L_{max}}$ = 150 mA.

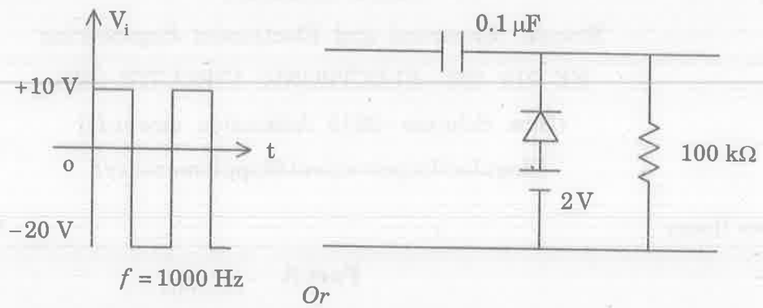
(5 × 5 = 25 marks)

Turn over

Part C

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

11. Explain the working of the circuit shown below : Obtain the output V_o for the input indicated.



Or

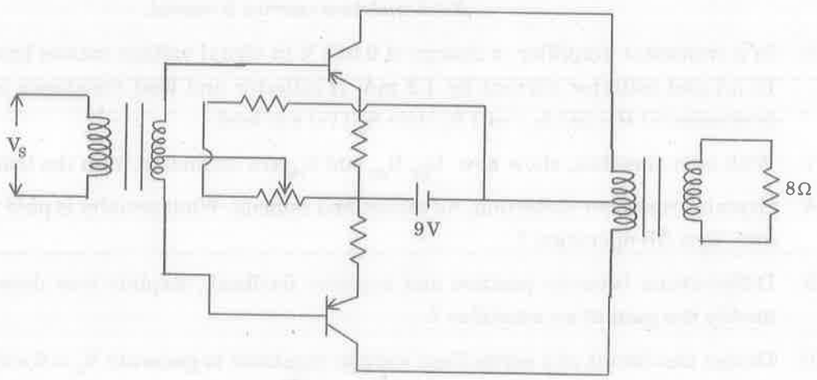
12. Draw the circuit of self biased FET amplifier and explain its working. Derive expressions for the Z_i, Z_o and A_v using small signal equivalent model.

13. Describe the function of each component of the voltage divider bias RC coupled CE amplifier. Show, with the help of expressions the effects of the coupling and bypass capacitors on the lower cut-off frequency of the amplifier.

Or

14. Derive the h-parameter equations and the corresponding equivalent circuit of a CE amplifier. Obtain its R_i and A_i.

15. Design the following power amplifier circuit to deliver 500 mW to the 8 Ω load. Obtain the component values, with necessary justifications.



Or

16. For class A, Common Emitter amplifier, show that $P_{cc} = \frac{V_{cc}^2}{R}$ which is constant and independent of signal current as long as distortion is negligible. Draw the required circuit diagram and deduce the relation to prove the above equation. Show that locus of all the operating points at which collector dissipation is exactly Pc_{max} lies on a parabola.

17. (a) What are the four possible topologies of a negative feedback amplifier ? Give block diagrams and identify the transfer gain for each topology.

    (b) Explain, with necessary equations, the effect of negative feedback on the input resistance of voltage series and current shunt feedback amplifier.

Or

18. (a) Describe a Hartley oscillator circuit. Explain how oscillations are produced and sustained in it ?

    (b) Explain the factors which affect the frequency stability of an oscillator. How they are implied by a crystal oscillator ?

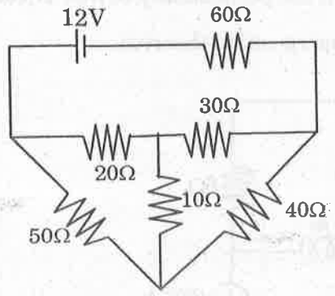
19. With neat circuit diagram and base and collector waveforms, describe the working of an Astable multivibrator. Design the circuit to generate square waves of 600 Hz, 60 % duty cycle, having amplitude 0 – 6 V.

Or

20. Explain the working principle of a VJT and a relaxation oscillator circuit using UJT with necessary waveforms. Design the circuit to generate sweep at 600 Hz, 6 V amplitude.

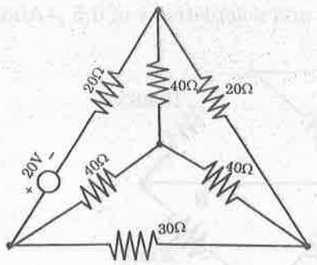
(5 × 12 = 60 marks)

19. For the network shown below, draw the oriented graph of the network. Select a tree with branches 10 Ω, 20 Ω and 30 Ω as tree branches, write the tie-set and cut-set schedules.



Or

20. Determine the number of branches, number of nodes and number of links for the circuit given below : Write down the incidence matrix. Also develop the network equilibrium equation.



(5 × 12 = 60 marks)

F 4780 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Branch : Electrical and Electronics Engineering

ELECTRIC CIRCUIT THEORY (E)

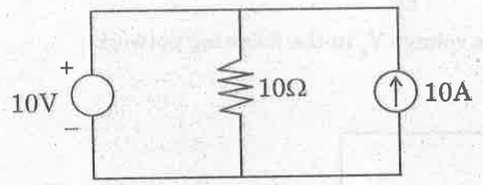
(Old Scheme—Prior to 2010 Admissions—Supplementary/Mercy Chance)

Time : Three Hours Maximum : 100 Marks

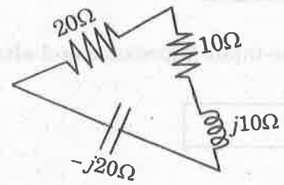
Part A

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

1. With the help of examples, give the differences between dependent and independent sources.
2. Calculate the power converted at the voltage sources and current sources of the following circuit.



3. What are the properties of an ideal transformer ?
4. Explain the dot rule for coupled circuits.
5. Explain Tellegen theorem with the help of an example.
6. Replace the following delta connected network by an equivalent star connection.



7. Show that the sum of three-phase e.m.f's is zero in a three-phase a.c. circuit.
8. Differentiate between real, reactive and apparent powers in a three-phase system.
9. What are the favorable features of PSPICE suitable for circuit applications ?
10. What are the properties of a tree in a graph ?

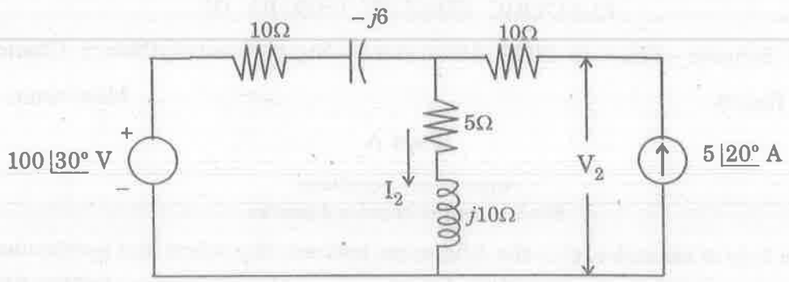
(10 × 4 = 40 marks)

Turn over

Part B

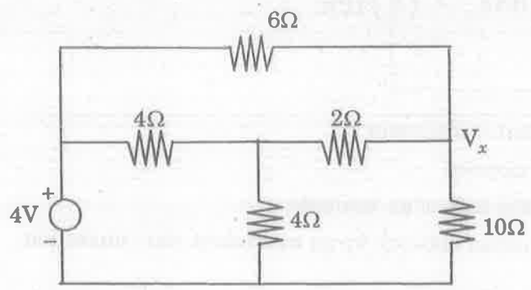
Answer **all** *questions.*
Each full question carries 12 *marks.*

11. By the method of nodal analysis, calculate the values of I_2 and V_2 in the following network :

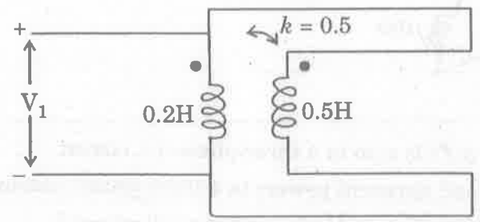


Or

12. Using source transformation, find the voltage V_x in the following network :



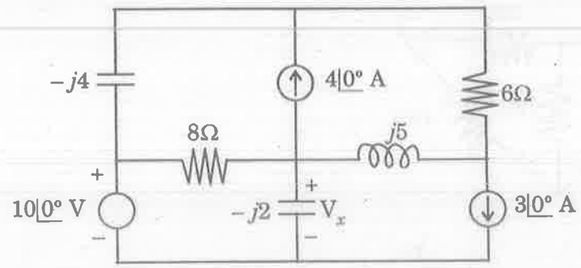
13. In the coupled circuit shown below, find the input impedance and also the net inductance.



Or

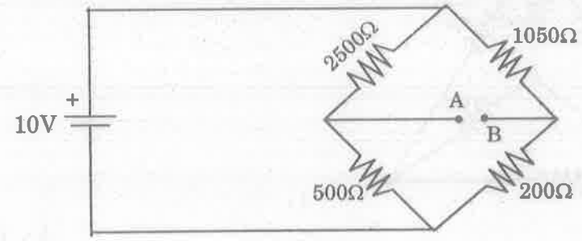
14. Two coils having 500 and 5000 turns are wound on a closed iron circuit of sections 60 cm^2 and mean length 150 cm. Calculate the self inductance of each coil. Also calculate the mutual inductance and coefficient of coupling between the coils if the permeability of iron is 1000.

15. Calculate V_0 in the following circuit using superposition theorem.



Or

16. Use Thevenin's theorem on the bridge circuit shown below to find the deflection of a galvanometer connected to AB with a resistance of 100 W and a sensitivity of 0.5 μ A/mm.



17. A balanced delta-connected load consumes 2 kW of power, when connected to 400 V, 50 Hz, 3 ϕ a.c. supply, and draws a current of 2A at a lagging p.f. when connected to 230 V, 3 ϕ supply. Determine : (i) Resistance and inductance per phase ; (ii) Load p.f. ; (iii) Power consumed, when load connection changed to star and supply voltage 400 V.

Or

18. A delta load of $Z_{AB} = 52 \angle 45° \Omega$, $Z_{BC} = 52 \angle -30° \Omega$ $Z_{CA} = 10 \angle 0° \Omega$ are connected to a 230V, 3 ϕ source. Find the magnitude of the line currents, when the phase sequence is ABC.

F 4789 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Branch : Electrical and Electronics Engineering

ELECTROMAGNETIC THEORY (E)

(Old Scheme—Supplementary/Mercy Chance)

[Prior to 2010 Admissions]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 4 *marks.*

1. Explain the concept of electric flux.
2. Give the relation between cartesian and cylindrical co-ordinate systems.
3. Explain the concept of electric scalar potential and potential gradient.
4. Derive an expression for the energy stored in an electrostatic field.
5. An infinite line charge of 10 μC/m density is placed along x-axis. Calculate the field intensity at a point P (1, 2, – 1).
6. State the boundary conditions for electric field at the interface of two perfect dielectrics.
7. Define vector magnetic potential. Derive an expression for it.
8. Derive the expression for the self inductance for a solenoid.
9. State Maxwell's equations in point form.
10. Distinguish between conduction current and displacement current.

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*

Each question carries 12 *marks.*

11. (a) Evaluate $\oint \overline{A} \cdot d\overline{S}$ over the surface of the cube with the centre at the origin and the length of the side 'a'.

(6 marks)

(b) Express the vector $\overline{F} = 2xyz\,\hat{a}_x - 5\,(x+y+z)\,\hat{a}_z$ in cylindrical co-ordinates. Find the magnitude of the vector at P (2, 60°, 3).

(6 marks)

Or

Turn over

12. (a) Find the electric potential at a point (0, 0, 2) on z-axis for a uniform line charge ρ_z c/m in the form of a ring $\rho = a$ on a plane $z = 0$.

(6 marks)

(b) The infinite line charge parallel to z-axis is at $x = 6$, $y = 10$. Find $\overline{E}$ at the general point P (x, y, z) in cartesian system.

(6 marks)

13. Define electrical potential. Show that in an electric field, the potential difference between two points a and b along the path, $V_a - V_b = -\int_a^b \mathbf{E} \cdot dl$.

Or

14. Determine the total energy contained in the electric field outside a radial distance of 10 m. from a concentrated charge of 10 μC that exists in a dielectric of $\epsilon_r = 4.5$. Derive the relationship used.

15. (a) Derive the expression for the capacitance of isolated sphere coated with dielectric.

(6 marks)

(b) Calculate the current density and E for an aluminium having drift velocity of electrons 5.3×10^{-4} m/s, conductivity 3.82×10^7 s/m and $\mu_e = 0.0014$ m.^{2}/V-s.

(6 marks)

Or

16. (a) If the earth is considered as a spherical capacitor, what is its capacitance ? Assume the radius of earth to be 6370 km.

(6 marks)

(b) A point charge Q is placed between two earthed intersecting conducting planes that are inclined at 45° to each other. Determine the number of image charges and their locations.

(6 marks)

17. (a) A circular loop of wire of radius 'r' lying in the x-y plane with its centre at the origin carries a current I in z direction. Find 'B' at the centre.

(6 marks)

(b) Explain magnetic moment. Derive the expression for the torque on a closed circuit.

(6 marks)

Or

18. (a) What is displacement current ? Derive the expression for the same. (6 marks)

(b) An infinitesimal length 10^{-3} m. of wire is located at the point (1, 0, 0) and carries a current 2A in the direction of unit vector $\hat{x}$. Find the magnetic field intensity.

(6 marks)

19. (a) Derive the general wave equation. (5 marks)

(b) State and explain the Maxwell's equation for time varying fields in integral and differential forms.

(7 marks)

Or

20. With neat sketches, explain the propagation of electromagnetic waves along transmission line. Derive expression for the voltage and current at any point along the uniform transmission line.

[5 × 12 = 60 marks]