F 9312 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION NOVEMBER 2011

Third Semester

Branch—Electrical and Electronics Engineering

EE 010 305—ELECTRONICS CIRCUITS (EE)

(Regular)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 3 *marks.*

1. Plot and explain the output characteristics of BJT in common emitter configuration.
2. Name and mathematically express different h-parameters of a BJT in CE model.
3. Explain the drawbacks of a class A power amplifier.
4. What is feedback in amplifiers ? Classify List advantages and disadvantages of both.
5. What is regulation ? What is the need of voltage regulation ?

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. Sketch a combination clipper circuit. Explain its working.
7. What are the advantages of cascading amplifier stages ? If each of two cascades stages has a voltage gain of 30, find the overall gain of a two stage amplifier.
8. What is a tuned amplifier ? Classify. Sketch frequency responses of both. Mention uses of tuned amplifiers.
9. What are crystal oscillators ? Explain its working principle. Explain any one crystal oscillator. List advantages of using crystal oscillators.
10. With diagram, explain the working of a Miller sweep generator circuit.

(5 × 5 = 25 marks)

Part C

Each full question carries 12 *marks.*

11. (a) Explain the stability factor and thermal runaway in transistor biasing.

    (b) With diagram, explain the working of collector to base bias transistor circuit in common emitter configuration. Discuss its merits and demerits over other biasing schemes.

Or

Turn over

12. With neat sketch, explain the operation of common emitter JFET amplifier. Sketch its frequency response and give the analysis of the circuit mathematically.

13. With circuit diagram, explain the working of a 2-stage RC coupled amplifier and derive the output relation of each stage.

Or

14. Derive the relationship between cut-off frequency and bandwidth in an RC coupled amplifier in single stage and double stage. Compare both.

15. With circuit diagram, explain the working of complementary symmetry amplifiers. Describe its advantages over other models.

Or

16. Explain the operation of class B power amplifier. Derive the equation of power gain and efficiency.

17. With diagram, explain the working of a current shunt feedback circuit.

Or

18. Explain the operation of RC phase shift oscillator with neat circuit diagram. Give equation of frequency of oscillation.

19. With circuit diagram, explain the operation of astable multivibrator.

Or

20. Sketch a monostable multivibrator. Derive the design steps and give the necessary mathematical representation at each step.

(5 × 12 = 60 marks)

F 9321 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch—Electrical and Electronics Engineering

EE 010 306—MECHANICAL TECHNOLOGY (EE)

(Regular)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 3 *marks.*

1. Define the terms Dynamic viscosity and Kinematic viscosity.
2. Explain the significance of Coefficient of discharge (C_d) of a venturimeter.
3. Mention the classifications of hydraulic turbines with examples.
4. What is the need of priming the centrifugal pumps ?
5. Why negative slips are occuring in receiprocating pumps ?

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. Define the term Pascal's law. Mention its applications.
7. Explain the major and minor losses in flow of fluids.
8. With neat sketches, explain different types of casings of a centrifugal pump.
9. Explain the theoritical and actual indicator diagram of a receiprocating pump.
10. Mention the uses and types of draft tube with sketches.

(5 × 5 = 25 marks)

Part C

Each question carries 12 *marks.*

11. With the help of neat sketches, explain different types of manometers.

Or

12. Write notes on :
    (a) Bulk modulous.
    (b) Surface tension.
    (c) Capillarity.

Turn over

13. Derive an equation for the Bernoulli's equation.

Or

14. Explain the following types of flow :
    (a) Uniform and non-uniform flow.
    (b) Steady and unsteady flow.
    (c) Laminar and turbulent flow.

15. With a neat sketch, explain the working of a Pelton turbine.

Or

16. Explain the working of a hydraulic governer in Pelton turbine.

17. With neat sketches, explain different types of impellers of a centrifugal pump.

Or

18. Explain the working of a hydraulic ram. Mention the principle and advantages of the hydraulic rams.

19. Derive an expression for the acceleration head of a reciprocating pump.

Or

20. Explain the working of gear pumps and vane pumps.

(5 × 12 = 60 marks)

F 9302 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch : Electrical and Electronics Engineering

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

(Regular)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 3 *marks.*

1. Define Torque weight ratio and sensitivity of an instrument.
2. What are the types of detectors used in AC bridges ?
3. What are the special features incorporated in low power factor wattmeter ?
4. List the most commonly used types of current transformers.
5. What is the principle of magnetic focussing ?

(5 × 3 = 15 marks)

Part B

Each question carries 5 *marks.*

6. What is the necessity of damping ? How damping is provided in PMMC Instrument ?
7. Discuss the measurement of self inductance of a coil using Anderson bridge.
8. Explain the operation of single phase dynamometer type power factor meter.
9. Discuss the method of calibration of wattmeter using potentiometer.
10. Explain the method of experimental determination of flux density in a specimen of magnetic material.

(5 × 5 = 25 marks)

Part C

11. (a) Explain the construction and operation of Rectifier type instrument. (8 marks)

(b) The scale of a moving coil voltmeter is divided into 100 divisions. The dimensions of the coil are 3cm and 2.5cm and has 150 turns. The air gap flux density is 0.15 wb/m^2. Determine the series resistance when the meter is to be used for 0–100 V. The spring constant is 2.5×10^{-6} Nm per division and the resistance of the coil is 1 Ω. (4 marks)

Or

Turn over

12. (a) Discuss the construction and operation of Hot wire instrument. (8 marks)

(b) A 150 V Moving Iron voltmeter has an inductance of 0.75 henry and a total resistance of 2000 Ω. It is calibrated to read correctly on a 50 Hz circuit. What series resistance would be necessary to increase its range to 600 V ? (4 marks)

13. (a) Draw the diagram of a.c. coordinate type potentiometer and explain its working. (7 marks)

(b) Write short notes on PO Box. (5 marks)

Or

14. (a) Explain how a potentiometer can be used for calibration of ammeter. (7 marks)

(b) Obtain the balance Equations for comparing Inductance and Capacitance using Maxwell's bridge. (5 marks)

15. (a) Explain the various errors in dynamometer wattmeter and their compensation. (7 marks)

(b) A 250V, single phase energy meter has a constant load current of 4A passing through it for 5 hours at unity power factor. If the meter makes 1200 revolutions during this period, What is the meter constant ? If the load power factor is 0.8, find the number of revolutions the disc will make in the above time. (5 marks)

Or

16. Write short notes on the following :

(a) Three phase energy meter.

(b) TOD meter. (2 × 6 = 12 marks)

17. (a) Explain the use of Instrument transformers in extension of range of instruments. (7 marks)

(b) A 1000/5 A current transformer, bar primary type has loss component of exciting current equal to 0.7% of the primary current. Find the ratio error

(i) when turns ratio is equal to nominal ratio.

(ii) when the secondary turns is reduced by 0.5%. (5 marks)

Or

18. Explain the operation of :

(a) Electrodynamometer frequency meter.

(b) Mechanical resonance frequency meter. (6 × 2 = 12 marks)

19. (a) Explain how voltage, frequency and phase can be measured using CRO. (7 marks)

(b) What are man requirements in magnetic measurements ? (5 marks)

Or

20. Write short notes on the following :

(a) Iron loss measurement.

(b) Digital voltmeter. (2 × 6 = 12 marks)

[5 × 12 = 60 marks]

F 9287 (Pages : 3) Reg. No. 7 cobles

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch : Civil/Mechanical/Electrical and Electronics/Automobile/Aeronautical/Electronics and Communication/Applied Electronics and Instrumentation/Electronics and Instrumentation/Instrumentation and Control Engineering/Production Engineering/Polymer Engineering

EN 010 301 A—ENGINEERING MATHEMATICS—II (CE, ME, EE, AU, AN, EC, AI, EI, IC, PE AND PO)

(Regular)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Find a unit vector normal to the surface $xy^3z^2 = 4$ at the point $(-1, -1, 2)$.
2. If S is any closed surface, prove that $\int_S \text{curl } \bar{F} \cdot d\bar{S} = 0$.
3. Evaluate $\Delta^2 \cos 2x$.
4. What is Simpson's one-third rule ? How it is related to Newton-Cote's formula ?
5. Find the inverse transform of $\frac{2z^2 + 3z}{(z+2)(z-4)}$.

(5 × 3 = 15 marks)

Part B

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

6. Find div $\bar{F}$ and curl $\bar{F}$, where $\bar{F} = \text{grad}\left(x^3 + y^3 + z^3 - 3xyz\right)$.
7. Find the work done in moving a particle in the force field $\bar{F} = 3x^2\hat{i} + (2xz - y)\,\hat{j} + z\hat{k}$ along the curve defined by $x^2 = 4y$, $3x^3 = 8z$ from $x = 0$ to $x = 2$.
8. Prove that $e^x = \left(\frac{\Delta^2}{E}\right) e^x \cdot \frac{Ee^x}{\Delta^2 e^x}$, the interval of differencing is h.

Turn over

9. A solid of revolution is formed by rotating about the x-axis, the area between the x-axis, the lines $x = 0$ and $x = 1$ and a curve through the points with the following co-ordinates :

x :	0.00	0.25	0.50	0.75	1.00
y :	1.0000	0.9898	0.9589	0.9089	0.8415

Estimate the volume of the solid formed using Simpson's rule.

10. Solve $y_{n+2} - 4y_{n+1} + 3y_n = 5^n$.

(5 × 5 = 25 marks)

Part C

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) If $r = \sqrt{x^2 + y^2 + z^2}$, show that $\nabla^2\left(r^n\right) = n(n+1)r^{n-2}$ and hence deduce that $\nabla^2\left(\frac{1}{r}\right) = 0$, except at $r = 0$.

(6 marks)

(b) Show that curl $\left(\phi\bar{A}\right) = \text{grad } \phi \times \bar{A} + \phi \text{ curl } \bar{A}$. (6 marks)

Or

12. (a) Find the directional derivative of $\nabla \cdot (\nabla\phi)$ at the point $(1, -2, 1)$ in the direction of the normal to the surface $xy^2z = 3x + z^2$; where $\phi = 2x^3y^2z^4$.

(6 marks)

(b) Show that curl $\left(\bar{u} \times \bar{v}\right) = \left(\bar{v} \cdot \nabla\right)\bar{u} - \left(\bar{u} \cdot \nabla\right)\bar{v} + \bar{u} \text{ div } \bar{v} - \bar{v} \text{ div } \bar{u}$. (6 marks)

Module 2

13. Verify divergence theorem for $\bar{F} = (2xy + z)\,\hat{i} + y^2\hat{j} - (x + 3y)\,\hat{k}$ when the surface S is that of the region bounded by the plane $2x + 2y + z = 6$ in the first octant.

Or

14. Use Stoke's theorem to calculate $\oint_C (ydx + zdy + xdz)$, where C is the curve of intersection of $x + y = 2$ and $x^2 + y^2 + z^2 - 2x - 2y = 0$.

Module 3

15. Using Newton's forward interpolation formula, estimate the number of students who scored marks between 40 and 45 :

Marks	:	30—40	40—50	50—60	60—70	70—80
No. of students	:	31	42	51	35	31

Or

16. Use Lagrange's formula to find the form of $f(x)$, given :

x	:	0	2	3	6
$f(x)$	:	648	704	729	792

Module 4

17. Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using (i) trapezoidal rule ; (ii) Simpson's 1/3rd rule ; and (iii) Simpson's 3/8th rule. Compare their accuracies.

Or

18. Find the first and second derivatives of the function from the following table at point $x = 1.1$:

x	:	1.0	1.2	1.4	1.6	1.8	2.0
$f(x)$	:	0.0	0.128	0.544	1.296	2.423	4.01

Module 5

19. (a) If $\bar{u}(z) = \frac{2z^2+5z+14}{(z-1)^4}$, evaluate u_2 and u_3. (6 marks)

(b) Using the z-transform, solve $u_{n+2} + 4u_{n+1} + 3u_n = 2^n$ with $u_0 = 0$, $u_1 = 1$. (6 marks)

Or

20. (a) Show that $z\left(\frac{1}{n+1}\right) = z \log\left(\frac{z}{z+1}\right)$. (6 marks)

(b) Using Convolution theorem, evaluate $z^{-1}\left[\frac{z^2}{(z-1)(z-3)}\right]$. (6 marks)

[5 × 12 = 60 marks]

F 9289 (Pages : 2) Reg. No.....12 صف دراب

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

EN 010 302—ECONOMICS AND COMMUNICATION SKILLS (AI, AN, AU, CE, CS, EC, EE, EI, IC, IT, ME, PE and PO)

(Regular)

[Common to all Branches]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Name three Commercial banks. Describe their main functions.
2. Explain the meaning of Globalisation.
3. What is incidence of tax ? Explain.
4. What are the causes of inflation ?
5. List any *six* arguments in support of protectionism.

(5 × 3 = 15 marks)

Part B

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

6. Explain how Commercial banks aid Economic Development of a country.
7. Discuss the various effects and defects of privatisation.
8. What is meant by direct and indirect taxes ? Give *four* examples each with your reasons.
9. Define National Income and per capita income and account for the low level of per capita income in under-developed countries.
10. Why is international trade distinguished from domestic or inter-regional trade ?

(5 × 5 = 25 marks)

Part C

Answer any **one** *question from each module.*
Each question carries 12 *marks.*

Module I

11. State and explain the major financial institutions in India providing financial assistance to industries.

Or

Turn over

12. Explain the various credit control methods ? What are the methods used by the RBI to control the creation of credit by Commercial banks.

Module II

13. Discuss the impact of multinational companies in Indian economy.

Or

14. Describe the growth and development of Information Technology industries in India.

Module III

15. Explain clearly the characteristics of good tax system.

Or

16. Define tax and explain its features. Distinguish between incidence and shifting of a tax. What are the factors influencing the shifting of a tax ?

Module IV

17. How is National Income estimated ? Bring out the difficulties involved in National Income estimation in under-developed countries.

Or

18. Define inflation and explain the types of inflation. What are the effects of inflation ? How is inflation controlled ?

Module V

19. What is free trade ? What are its advantages ? What is the case against free trade ?

Or

20. Distinguish between Balance of Trade and Balance of Payments. Why must the balance of payments balance in the long run ?

(5 × 12 = 60 marks)

F 9247 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch : Electrical and Electronics Engineering

MECHANICAL TECHNOLOGY (E)

(2009 Admissions—Improvement)

(2004-2009 Admissions—Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

1. Define and give the units of (a) Absolute viscosity ; (b) Kinematic viscosity.
2. Explain the various of viscosity of fluids with temperature and pressure.
3. Define and explain total energy line.
4. Explain different types of flows.
5. Compare impulse and reaction turbines with examples.
6. Explain different types of draft tubes.
7. Explain hydraulic balancing methods with examples.
8. Draw the main characteristics of a centrifugal pump.
9. Explain with working of a vane pump.
10. Explain the classification of reciprocating pumps.

(10 × 4 = 40 marks)

Part B

11. Derive the expressions for the capillary rise and fall when a narrow tube of diameter '*d*' is inserted in (a) water and (b) mercury of specific gravity 13.6.

(12 marks)

Or

12. Calculate the dynamic viscosity of oil. which is used for lubrication between a square plate of size 0.8 m × 0.8 m and an inclined plane with an angle of inclination of 30 degrees. The weight of the square plate is 300 N and it slides down the inclined plane with a velocity of 0.3 m/s. The thickness of oil film is 1.5 mm.

(12 marks)

Turn over

13. Derive Darcy-Weisbach equation. (12 marks)

Or

14. Explain different types of minor losses. Derive an expression for the head loss due to sudden enlargement. (12 marks)

15. A pelton turbine develops 3000 kW under a head of 300 m. The overall efficiency of the turbine is 83%. If speed ratio = 0.46, Cv = 0.98 and specific speed is 16.5 then find : (a) Diameter of the turbine and (b) Diameter of the jet. (12 marks)

Or

16. Explain the characteristic curves of a hydraulic turbine. (12 marks)

17. Explain different efficiency of a centrifugal pump. (12 marks)

Or

18. (a) How is self priming done in centrifugal pump ? (6 marks)

    (b) Write a note on note on classification of dynamic pumps. (6 marks)

19. (a) Explain the applications of positive displacement pumps. (6 marks)

    (b) Explain the cavitation in reciprocating pumps. How it can be avoided ? (6 marks)

Or

20. A single acting reciprocating pump running at 30 r.p.m. delivers 0.012 m^3/s of water. The diameter of the piston is 25 cm and stroke length 50 cm. Determine (a) The theoretical discharge of the pump (b) co-efficient of discharge and ; (c) Slip and percentage slip of the pump. (12 marks)

[5 × 12 = 60 marks]

MODULE IV

17. In the circuit shown in Fig. 6, find the voltage across the 10 ohm resistor and also the current supplied by the source :

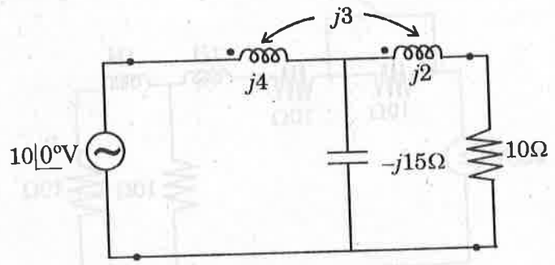

Fig. 6

Or

18. Synthesise the following driving point impedance in boththe foster forms and draw the network.

(a) $\dfrac{s\left(s^2+2\right)\left(s^2+5\right)}{\left(s^2+1\right)\left(s^2+4\right)}$.

(b) $\dfrac{\left(s^2+2\right)\left(s^2+5\right)}{s\left(s^2+4\right)\left(s^2+9\right)}$.

MODULE V

19. Between any two terminals of a 3-phase balanced load the voltage is 415 volt and the resistance is 3 Ω. The current in each of the lines is 100 A and the supply phase sequence is RYB. Find the power factor of the load. Find also the resistance and reactance per phase of the load with :

(i) Star Connection. (ii) Delta Connection.

Or

20. A 3-phase, 440 V delta connected system has the loads : branch RY, 20 kW at unity power factor ; branch YB, 30 kVA at power factor 0.8 lagging ; branch BR , 20 kVA at power factor 0.6 leading. Find (a) the line currents ; and (b) balanced Y connected resistors that would take same power as the above load from the same supply.

(5 × 12 = 60 marks)

F 9295 (Pages : 4) **Reg. No**.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch : Electrical and Electronics Engineering

EE 010 303—ELECTRIC CIRCUIT THEORY (EE)

(Regular)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain the necessary conditions to be satisfied by the driving point impedance function.
2. Show that the variation of current in a series RC circuit for a d.c. excitation is exponential.
3. Define : Graph, tree and tie set.
4. Explain dot convention in coupled circuits.
5. Three impedances z_1, z_2 and z_3 are connected in delta. From basics, obtain the Y equivalent.

(5 × 3 = 15 marks)

Part B

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

6. Show that a voltage source with an internal resistance R_{in} can be replaced by an equivalent current source and the power delivered to an external resistance in either case is the same.
7. A circuit of resistance 20 Ω and inductance 0.2 H in series has a direct voltage of 250 V suddenly applied to it. Find the voltage drop across the inductor at the instant of switching on and at 0.01 sec later.
8. Define Cut-set and basic cut-set. If e is the number of elements and n-the nodes, how many trees will be there in the graph ?
9. Two similar coupled coils of resistance 5 Ω and self inductance 1 H are in series. This is in series with a 100 μF capacitor. A 220 V, 50 Hz source energises the circuit. Draw the circuit, place the dot markings and calculate the coupling coefficient sothat the circuit behaves like a pure resistor.
10. Taking V_{BC} as reference, show all the line and phase voltages for ABC and CBA sequences in a 3-phase circuit.

(5 × 5 = 25 marks)

Turn over

Part C

Answer any **one** *full questions from each module.*
Each full question carries 12 *marks.*

Module I

11. Find v_L in the circuit of Fig. 1 using Superposition theorem.

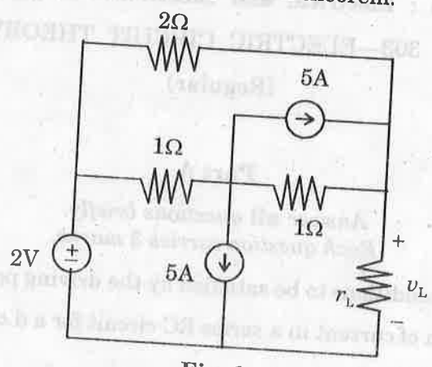

Fig. 1

Or

12. Obtain the maximum amount of power transfer in R from the sources using the theorems of Maximum power transfer in the network shown in Fig. 2. At what value of R the maximum power transfer will occur ?

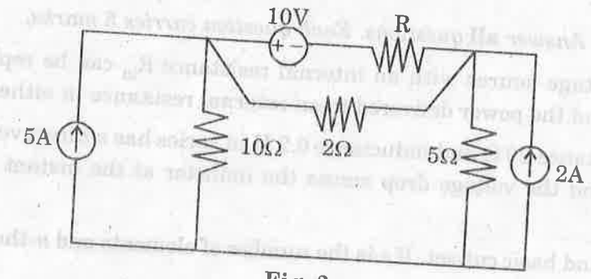

Fig. 2

Module II

13. An a.c. voltage of $v = V \sin 500 \pi t$ is applied to a series RL circuit. If the L – R circuit has R = 10 Ω and L = 0.1 H, calculate the ratio of maximum value to which the current rise to the steady state maximum value when the voltage is applied at an instant $t = 0.002$ sec.

Or

14. A network has been shown in Fig. 3. The switch S is closed at $t = 0$. Find the current through R_L using Thevenin's theorem. Assume steady state condition before switching.

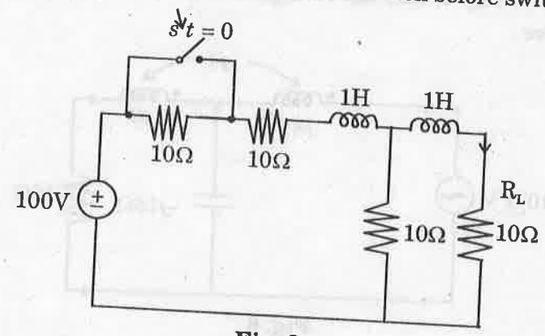

Fig. 3.

Module III

15. For the network graph shown in Fig. 4, select a suitable tree and obtain the tie-set matrix. Hence write the Kirchhoff's voltage law equations.

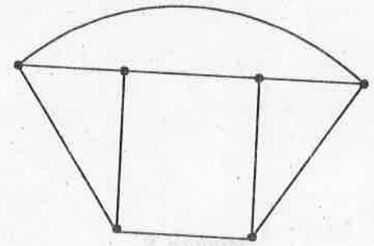

Fig. 4

Or

16. In the ladder circuit shown in Fig. 5, with input current $i(t) = 10 \cos 50{,}000\ t$ mA, write a MATLAB program to determine the steady state voltages in the circuit.

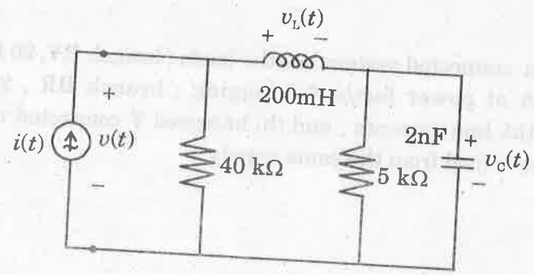

Fig. 5

(c) A curve is given by the table :

x :	0	1	2	3	4	5	6
y :	0	2	2.5	2.3	2	1.7	1.5

The x-co-ordinate of the centre of gravity of the area bounded by the curve, the end ordinates and the x-axis is given by $A\bar{x} = \int_0^6 xy\,dx$, where A is the area. Find $\bar{x}$ by using Simpson's rule. (12 marks)

(d) Find the missing value using backward difference formula :

x :	0	1	2	3	4
y :	1	3	9	—	81

Explain why the result differs from $3^3 = 27$. (8 marks)

[5 × 20 = 100 marks]

F 9243 (Pages : 4) Reg. No.....EEE

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branches : Civil, Mechanical, Electrical and Electronics, Electronics and Communication, Polymer, Applied Electronics and Instrumentation, Instrumentation and Control, Electronics and Instrumentation, Automobile Engineering, Aeronautical Engineering

ENGINEERING MATHEMATICS—II (CMEPLANSUF)

(2009 admissions—Improvement ; 2004—2009 admissions—Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer any **one** *full question from each module.*
Each full question carries 20 *marks.*

Module 1

1. (a) Find the directional derivation of $4xz^3 - 3x^2y^2$ at (2, – 1, 1) in the direction of $2\vec{i} - 3\vec{j} + 6\vec{k}$. (5 marks)

(b) Expand $\nabla \cdot (\vec{A} \times \vec{B})$. Deduce that if ϕ and ψ are differentiable scalar functions then $\nabla\phi \times \nabla\psi$ is solenoidal. (9 marks)

(c) If $\vec{A} = (4xy - 3x^2z^2)\vec{i} + 2x^2\vec{j} - 2x^3z\vec{k}$ show that $\int_C \vec{A} \cdot d\vec{r}$ is independent of the path C and find the scalar potential for $\vec{A}$. (6 marks)

Or

(d) Find div $\vec{F}$ and curl $\vec{F}$ if $\vec{F}$ = grad $(x^3 + y^3 + z^3 - 3xyz)$. (7 marks)

(e) Find the directional derivation of $f(x, y, z) = x^2y^2z^2$ at the point (1, 1, – 1) in the direction of the tangent to the curve $x = e^t$, $y = 1 + 2 \sin t$ and $z = t - \cos t$, where $-1 \le t \le 1$. (8 marks)

(f) If $\vec{f} = (x + y + 1)\vec{i} + \vec{j} - (x + y)\vec{k}$ show that $\vec{f} \cdot \text{curl } \vec{f} = 0$. (5 marks)

Module 2

2. (a) Using Green's theorem show that the area enclosed by any closed curve C is given by $\frac{1}{2}\oint (x\,dy - y\,dx)$. (5 marks)

(b) Verify Stoke's theorem for the function $\vec{F} = x^2\hat{i} + xy\hat{j}$ integrated round the square in the plane $z = 0$ whose sides are $x = 0$, $y = 0$, $x = a$, $y = a$.

(8 marks)

(c) Evaluate $\int_C \vec{F} \cdot d\vec{r}$ if $\vec{F} = xy\hat{i} + \left(x^2 + y^2\right)\hat{j}$ and C is the arc of $y = x^2 - 4$ from (2, 0) to (4, 12).

(7 marks)

Or

(d) Verify Green's theorem for $\int_C \left[\left[xy + y^2\right]dx + x^2 dy\right]$, where C is bounded by $y = x$ and $y = x^2$.

(10 marks)

(e) Evaluate $\int_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = xy\hat{i} + \left(x^2 + y^2\right)\hat{j}$ along the path of the straight line from (0, 0) to (1, 0) and then to (1, 1).

(5 marks)

(f) Find the total work done in moving a particle in a force field $\vec{f} = 3xy\,\vec{i} - y\vec{j} + 2zx\vec{k}$ once round the circle in xy plane whose centre is at origin and radius equal to 2 units.

(5 marks)

Module 3

3. (a) Define an analytic function. Derive the Cauchy Riemann equations for an analytic function $f(z)$.

(7 marks)

(b) If an analytic function $f(z) = u(x, y) + iv(x, y)$ is expressed in terms of the polar co-ordinates r and θ, show that $f'(z) = (\cos\theta - i\sin\theta)\dfrac{\partial f}{\partial r} = -\dfrac{\sin\theta + i\cos\theta}{r}\dfrac{\partial f}{\partial \theta}$.

(8 marks)

(c) State and prove CR equation in polar form.

(5 marks)

Or

(d) Define Bilinear transformation and show that the cross ratio of four points is unaltered by bilinear transformation.

(8 marks)

(e) Discuss the transformation $w = z + \dfrac{1}{z}$.

(7 marks)

(f) Show that the real and imaginary parts of an analytic function are harmonic (in the Cartesian form.)

(5 marks)

Module 4

4. (a) Construct the table of differences for the data below :

x	0	1	2	3	4
$f(x)$	1.0	1.5	2.2	3.1	4.6

Evaluate $\Delta^3 f(2)$.

(10 marks)

(b) The following table gives the values of x and y :

x	1.2	2.1	2.8	4.1	4.9	6.2
y	4.2	6.8	9.8	13.4	15.5	19.6

Find the value of corresponding to $x = 3.5$, using Lagrange's technique.

(10 marks)

Or

(c) Certain corresponding values of x and $\log_{10} x$ are given below :

x	300	304	305	307
$f(x)$	2.4771	2.4829	2.4843	2.4871

Find $\log_{10} 310$ by Newton's divided difference formula.

(10 marks)

(d) Given the table :

x	310	320	330	340	350	360
$\log x$	2.4914	2.5052	2.5185	2.5315	2.5441	2.5563

Find the value of log 337.5 by Stirling's formula.

(10 marks)

Module 5

5. (a) Evaluate $\int_0^6 \dfrac{dx}{1+x^2}$ by using (i) Trapezoidal rule ; (ii) Simpson's $\frac{1}{3}$ rule ; and (iii) Simpson's 3/8 rule and compare the results with actual value.

(12 marks)

(b) From the following table estimate the number of students who obtained marks more than 55 :—

Marks	31—40	41—50	51—60	61—70	71—80
Number of students	31	41	51	35	31

(8 marks)

Or

F 9265 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch : Electrical and Electronics Engineering

ELECTROMAGNETIC THEORY (E)

(2009 Admissions—Improvement 2004—2009 Admissions—Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Calculate the electric field intensity at p (–0.3, 0 –2. 0) due to a point charge of 4n C at Q (0. 2, 0.1, –2. 2) in air. All dimensions are in metres.
2. If A (x = 1, y = 2, z = –1), and B (P = 4, ϕ = – 50°, z = 3), find a unit vector in cylindrical co-ordinates at point B directed towards A.
3. What are equipotential contours ? How they are plotted ?
4. A positive point charge Q is at the centre of a spherical conducting shell of inner radius r_1 and outer radius r_2. Obtain the electric field and potential as functions of the radial distance.
5. Derive an expression for the capacitance per metre length of two long parallel conductors with radius r, separated by a distance d placed in air.
6. Explain the method of image to account for the effect of earth.
7. Find the boundary conditions between two magnetic materials with different permeabilities.
8. Explain skin effect and its practical significance ?
9. Write Maxwell's equations in point form and integral form.
10. Distinguish between conduction current and displacement current.

(10 × 4 = 40 marks)

Part B

Answer any one **full** *question from each module.*
Each full question carries 12 *marks.*

Module 1

11. (a) Transform the vector $\overline{A} = \frac{r}{\sqrt{r^2 + z^2}} \left(\cos \phi \, \overline{I}_r - \sin \phi \, \overline{I}_\phi - z \sin \phi \, \overline{I}_z \right)$ in cylindrical co-ordinates to spherical co-ordinates.

Turn over

(b) Given the two coplanar vectors $\bar{A} = 3\,\bar{a}_x + 4\,\bar{a}_y - 5\,\bar{a}_z$ and $\bar{B} = -6\,\bar{a}_x + 2\,\bar{a}_y - 4\,\bar{a}_z$. Obtain the unit vector normal to the plane containing the vectors $\bar{A}$ and $\bar{B}$.

Or

12. (a) State and explain Gauss's law in differential form and explain what do you mean by $\nabla . D$

(b) A square sheet defined by $-2 \le x \le 2\,m$, $-2 \le y \le 2m$ lies in the $z = -3$ m plane. The charge density on the sheet is $\rho_s = 2\left(x^2 + y^2 + 9\right)^{3/2}\ n\ C/m^2$. Calculate the electric field intensity at the origin.

Module 2

13. (a) A total charge of $\frac{40}{3}$ nC is uniformly distributed over a circular ring of radius 2 m placed in $z = 0$ plane, with centre as origin. Find the electric potential at A (0, 0, 5).

(b) If an electric potential is $V = \frac{10}{r^2} \sin\theta \sin\phi$, find $\bar{D}$ at $p\left(2, \frac{\pi}{2}, 0\right)$.

Or

14. Given the potential field $V = 100\,e^{-50x} \sin 50\,y$ in free space :

(a) Show that $\nabla \cdot \bar{D} = 0$.

(b) Show that $y = 0$ is an equipotential surface.

(c) Show that $\bar{E}$ is perpendicular to $y = 0$ plane.

(d) Find the total charge on the $y = 0$ plane, $0 < x < \infty$ and $0 < z < 1$. Assume that $y < 0$ is the conductor interior.

Module 3

15. (a) A cylindrical capacitor has radii a = 1 cm and b = 3 cm. If the space between the plates is filled with inhomogeneous dielectric with $E_r = \frac{5 + r}{r}$ where r is radius in cm, find the capacitance per metre of the capacitor.

(b) Find the total current in outward direction from a cube of 1 m, with one corner at the origin and edges parallel to the co-ordinate axes if $\bar{J} = 2x^2\,\bar{a}_x + 2xy^3\,\bar{a}_y + 2xy\,\bar{a}_y\ A/m^2$.

Or

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

(b) In a cylindrical conductor of r = 2mm, the $\bar{J}$ is $\bar{J} = 1000\,e^{-400r}\ A/m^2$. Find the total current.

Module 4

17. (a) A current filament carries a current of 10 A in the $\bar{a}_z$ direction on the z axis. Find the magnetic field intensity $\bar{H}$ at point p (1, 2, 3) due to this filament if it extends from.

(b) $z = -\infty$ to ∞ (b) $z = 0$ to $5m$ (c) $z = 5$ to ∞. Express the answers in Cartesian co-ordinates.

Or

18. (a) In the region $0 < r < 0 \cdot 5m$, in cylindrical co-ordinates, the current density is $\bar{J} = 4 \cdot 5\,e^{-2r}\,\bar{a}_z\ A/m^2$ and $\bar{J} = 0$ elsewhere. Use Ampere's circuital law to find $\bar{H}$.

(b) An iron ring toroid 0.2 m in diameter and 10.0 cm^2 cross-sectional area of the core is uniformly wound with 250 turns of wire. If the flux density in the core is 1.0 tesla and permeability of iron is 500, find the exciting current in the winding. Determine also the value of self-inductance and stored energy.

Module 5

19. Determine whether the following pairs of fields satisfy Maxwell's equations in the region where $\sigma = 0$, $\epsilon\ 2.5\epsilon_0$, $\mu = 10\,\mu_0$.

(a) $\bar{E} = 3y\,\hat{a}_y$ and $\bar{H} = 4x\,\hat{a}_x$

(b) $\bar{E} = 100 \sin(6 \times 10^7\ t) \sin z\ \hat{a}_y$ and $\bar{H} = -0.1328 \cos(6 \times 10^7\ t) \cos z\ \hat{a}_x$.

Or

20. (a) A voltage of 100 sin 400t is applied to a capacitor of 1 μF. Find the value of displacement current at $t = 1\ m$ sec.

(b) Derive the expression for the Poynting vector of a uniform plane wave travelling in free space.

(5 × 12 = 60 marks)

19. A 500 W lamp having MSCP of 100 is suspended 2.7 metres above the working plane. Calculate :

    (a) Illumination directly below the lamp at the working plane.

    (b) Lamp efficiency.

    (c) Illumination at a point 2.5 metres away on the horizontal plane from vertically below the lamp.

Or

20. (a) Explain various types of thermocouples and their construction and characteristics.

    (b) State the merits and demerits of thermocouples.

(5 × 12 = 60 marks)

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Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch : Electrical and Electronics Engineering

ELECTRICAL AND ELECTRONIC MEASUREMENTS (E)

(2009 Admissions—Improvement)

[2004—2009 Admissions—Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Define the following terms :

    (a) Units.

    (b) Fundamental units.

    (c) Absolute units.

    (d) Derived units.

2. Define (a) Voltage sensitivity and (b) Megohm sensitivity of a galvanometer. Give their units.
3. What factors must be considered for the operation of an AC potentiometer ?
4. What are the sources of measurement errors in a Wheatstone bridge ?
5. Draw the Maxwell's inductance bridge along with its phasor diagram.
6. Describe the sources and the null detectors used for a.c. bridges.
7. Distinguish between CT and PT ?
8. A meter reads 146.6V and the true value of the voltage is 146.54 V. Determine :

    (a) The static error and

    (b) The static correction for this instrument.

9. A 250 V lamp has a total flux of 3,000 lumens and takes a current of 0.8 A. Calculate MSCP per watt.
10. Compare and contrast thermistors and metal resistors.

(10 × 4 = 40 marks)

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. In one of the bridges, an expression for self inductance was derived as $L = \frac{R_2 R_3 C_4^2}{1 + w^2 C_4^2 R_4^2}$. Find out if this expression is correct or not. If not correct, suggest a suitable correction.

Or

12. A fluxmeter is connected to a search coil of 100 turns and the mean area of the coil is 5×10^{-4} m^2. The search coil is placed at the centre of a standard solenoid, 1 metre long, uniformly wound with 800 turns. When a current of 5A is reversed, a deflection of 10 scale divisions is obtained with the fluxmeter. Calculate the calibration constant of the instrument in weber-turn per division.

Module 2

13. (a) In a simple slide wire d.c. potentiometer, the voltage drop across a standard resistor of 0.1 Ω is balanced at 80 cm. Find the current if the standard cell e.m.f. of 1.45 volt is balanced at 40 cm.

(b) With neat diagrams, describe the construction and working of any one type of a.c. potentiometer.

Or

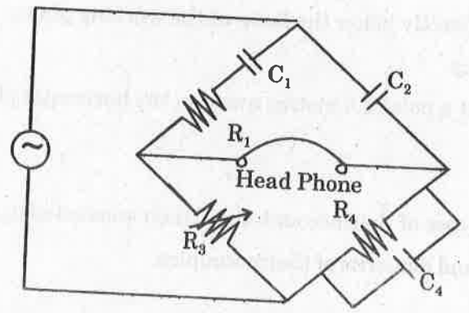
14. (a) With neat diagrams, explain the Kelvin's double bridge method of measurement of resistance. Derive the necessary equations.

(b) In a Kelvin's double bridge, there is error due to mismatch between the ratios of outer and inner arm resistances. The following data relate to this bridge.Standard resistance = 100.03 μΩ, Inner ratio arms = 100.31Ω, and 200 Ω. Outer ratio arms = 100.24 Ω and 200 Ω. The resistance of connecting leads from standard to unknown resistor is 680 μΩ. Calculate the unknown resistance.

Module 3

15. A bakelite sheet of 5 mm. thickness is tested at 50 Hz between the electrodes 12 cm. in diameter.

The Schering bridge used has an air capacitor C_2 of 106 pF, a non-reactive resistance R_4 of $\frac{1000}{\pi}\Omega$ in parallel with a variable capacitor C_4 and a non-reactive variable resistance R_3. Balance is obtained with $C_4 = 0.55$ μF and $R_3 = 270$ Ω Refer Figure on page 3..



Determine the following :

(a) Capacitance.

(b) Power factor and

(c) Relative permittivity of the sheet.

Or

16. With a neat diagram, describe the working of the Anderson bridge. Deduce the equations when the bridge is balanced. Explain how will you measure self-inductance using the bridge. Draw the phasor diagram of the voltages and currents of the bridge arms at balance.

Module 4

17. (a) Draw the phasor diagram of a Current Transformer and discuss the effect of variation of power factor of the secondary burden upon the performance.

(b) Explain phase angle error and on which factors does it depend ?

Or

18. Ten different sutdents tuned in the circuit for resonance and the values of resonant frequency in kHz were recorded as 444, 448, 460, 449, 455, 458, 451 447, 452, 450.

Calculate : (a) Arithmetic mean.

(b) Average deviation.

(c) Standard deviation and

(d) Variance.

F 9281 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch : Electrical and Electronics Engineering

POWER GENERATION AND DISTRIBUTION (E)

(2009 Admission-Improvement
2004 – 2009 Admission-Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain the terms plant capacity factor and plant use factor
2. What is depreciation? How it is determined?
3. Distinguish between feeder, distributor and service main in a distribution system.
4. Explain primary and secondary distribution in ac distribution system.
5. Briefly explain the rules for generation of electrical energy.
6. Explain how the low power factor affects power system.
7. Derive an expression for dielectric stress in a single core cable.
8. Explain Murray loop test for location of earth fault in underground cables.
9. Explain with diagrams, different types of rectifier circuits for producing high DC voltages.
10. Define the front and tail times of an impulse wave. What are the tolerances allowed as per the specifications?

(10 × 4 = 40 marks)

Part B

11. (a) Explain the selection of generating stations in the power system. (5 marks)

(b) A generating station has a maximum demand of 25 MW, a load factor of 60%, a plant capacity factor of 50% and a plant use factor of 72%. Find (i) the reserve capacity of the plant, (ii) the daily energy produced and (iii) the maximum energy that could be produced daily if the plant while running as per schedule were fully loaded. (7 marks)

Or

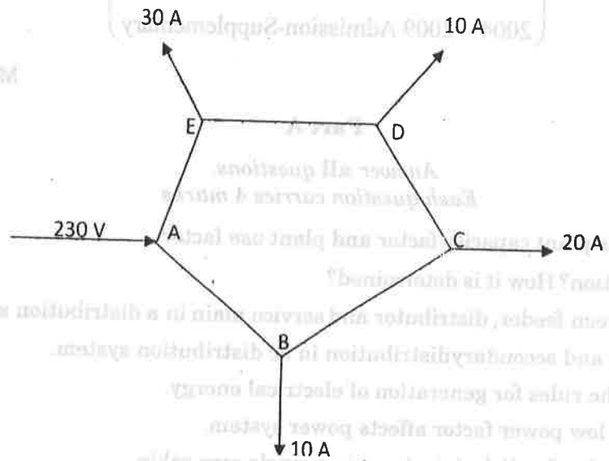
(c) Explain the important objectives and characteristics of tariff in a power system. (6 marks)

Turn over

(d) The daily load of an industry is 200 kW for first one hour, 150 kW for next seven hours, 50 kW for next eight hours and 1 kW for remaining time. If tariff in force is Rs. 100 per kW of maximum demand per annum plus 25 paise per kWh, find the annual bill.

(6 marks)

12. (a) A two wire ring main ABCDEA is fed from 230 V supply as shown in fig. The resistance of each section (go and return) AB, BC, CD, DE and EA is 0.1 Ω. The loads are tapped off as shown. Find the voltage at each load point.



(12 marks)

Or

(b) A single phase ring distributor ABC is fed at A. The loads at B and C are 40 A at 0.8 *p.f* lagging and 60 A at 0.6 *p.f* lagging respectively. Both power factors expressed are referred to voltage at point A. The total impedance of the sections AB, BC and CA are $(2 + j\,1)$, $(2 + j\,3)$ and $(1 + j\,2)$ ohms respectively. Determine the current in each section.

(12 marks)

13. (a) State and explain Kelvin's law? Mention its limitations.

(7 marks)

(b) Determine the best current density in A/mm^2 for a 3-ϕ overhead line if the line is in use for 2000 hours per year and if the conductor costing Rs.3 per kg has a specific resistance of 1.73 Ω-m and weighs 6200 kg/m^3. Cost of energy is 10 P/unit. Interest and depreciation is 12% of conductor cost.

(5 marks)

Or

(c) Write a short note on economics of power factor improvement. (5 marks)

(d) A factory takes a steady load of 250 kW at a lagging power factor of 0.8. The tariff is Rs. 100 per kVA of maximum demand per annum and plus 10 paise per kWh. The phase advancing plant costs Rs. 500 per kVAR and the annual interest and the depreciation together amount to 10%. Find

(i) the value to which the power factor be improved so that annual expenditure is minimum.

(ii) the capacity of phase advancing plant.

(iii) the new bill for energy assuming that the factory works for 5000 hours per annum.

(7 marks)

14 (a) Derive an expression for capacitance of a single core cable. (5 marks)

(b) A single core lead sheathed cable has a conductor diameter of 3 cm; the diameter of cable being 9 cm. The cable is graded by using two dielectrics of relative permittivity 5 and 4 respectively with corresponding safe working stresses of 30kV/cm and 20 kV/cm. Calculate the radial thickness of each insulation and the safe working voltage of cable.

(7marks)

Or

(c) Explain the inter sheath grading of cables. (7 marks)

(d) The Varley loop test is used to find the position of an earth fault on a line of length 40 km. The resistance/km of a single line is 28 Ω. The fixed resistors have resistances of 250 Ω each. The fault is calculated to be 7 km from the test end. To what value of resistance was the variable resistor set?

(5 marks)

15. (a) Why is a Cockcroft-Walton circuit preferred for voltage multiplier circuits? Explain its working with a schematic diagram.

(12 marks)

Or

(b) Give different circuits that produce impulse waves explaining clearly their relative merits and demerits

(7 marks)

(c) Explain the cascade connection of transformers for producing very high ac voltages.

(5 marks)

(5 × 12 = 60 marks)

9256 (Pages : 5) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Third Semester

Branch : Electrical and Electronics Engineering

ELECTRIC CIRCUITS THEORY (E)

(2009 Admissions—Improvement)

[2004—2009 Admissions—Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Describe all types of electrical energy sources.
2. A series RL circuit is in parallel with a capacitance. Find its input impedance.
3. Define and calculate the expression for Coefficient of coupling. How it can be varied ?
4. Obtain expressions for effective inductance when two coils are connected in :
   (a) Series aiding.
   (b) Series opposing.
   (c) Parallel aiding.
   (d) Parallel opposing.
5. State and explain Millman theorem with an example.
6. State and verify reciprocity theorem with the help of a suitable example.
7. A 3-phase balanced, delta connected load of $(4 + j8)\ \Omega$ is connected across a 400 V, 3–ϕ balanced supply. Determine the phase currents.
8. Explain the merits and demerits of 3-phase system compared to the single-phase system.
9. Explain :
   (a) Oriented graph.
   (b) Planar graph.
   (c) Loop.
   (d) Tree as applied to network topology.
10. The reduced incident matrix of an oriented graph is $A = \begin{bmatrix} 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & -1 & -1 & -1 \\ -1 & 0 & 0 & 0 & 1 \end{bmatrix}$. Draw the graph.

(10 × 4 = 40 marks)

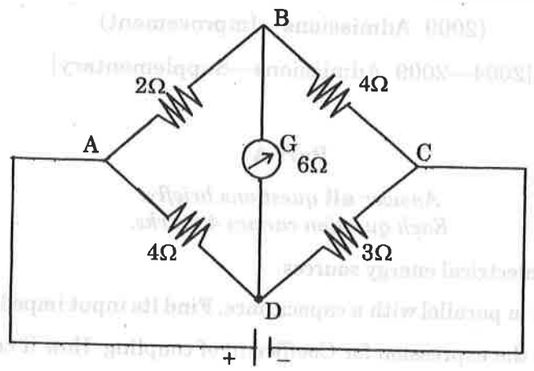
Turn over

Part B

Answer any **one** *full question from each module.*
Each full question carries 12 *marks.*

Module 1

11. Obtain the branch currents in the unbalanced bridge circuit of Fig. 1. Also determine the voltage drop across AC and the equivalent resistance between the terminals A and C in the bridge.



4 V, r_{int} = 2 Ω

Fig. 1

Or

12. (a) Find the driving point impedance of the network shown in Fig. 2.

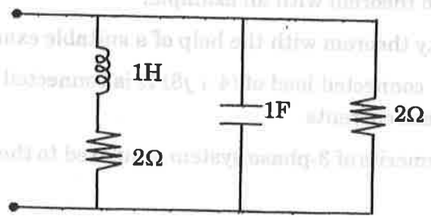


Fig. 2

(b) What should be the value of L such that Z(*s*) = 1 in the network of Fig. 3.

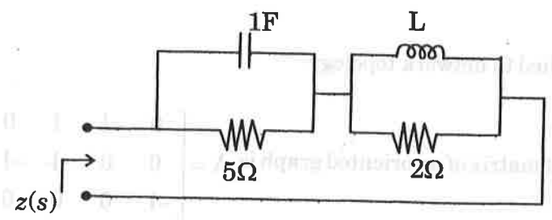


Fig. 3

Module 2

13. (a) Calculate the drop across resistor and capacitor in the circuit shown in Fig. 4.

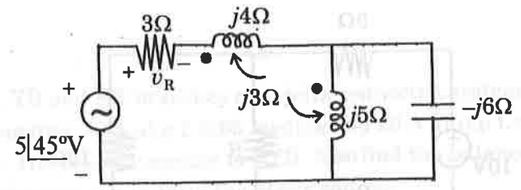


Fig. 4

(b) Find the expression for the mutual inductance in the series connection of two mutually coupled coils, when the two coils assist each other, the effective inductance is L_A and when the two coils oppose each other, the effective inductance is L_B.

Or

14. (a) For an ideal transformer, show that $\frac{V_1}{V_2} = \sqrt{\frac{L_1}{L_2}}$, where L_1 and L_2 are the self-inductances of the primary and secondary windings.

(b) Two coupled coils have K = 0.6, N_1 = 250 turns, N_2 = 500 turns and the mutual flux being 0.7 Wb, find the primary coil flux. If the primary current be 10 A, find the primary coil inductance. Also obtain the secondary inductance.

Module 3

15. (a) Find the value of Z_L to have maximum power from the $10\angle 0°$V voltage source. Also determine the amount of maximum power in Fig. 5.

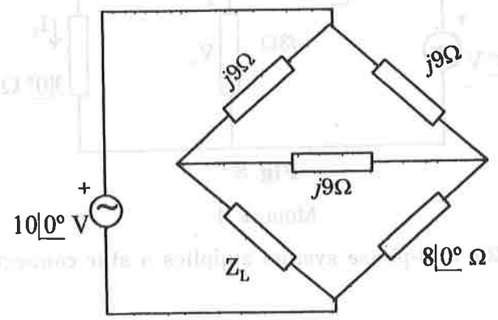


Fig. 5

Turn over

(b) In the circuit of Fig. 6, the resistance R is changed from 10 Ω to 5 Ω. Verify the compensation theorem.

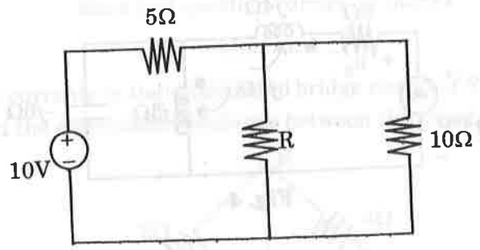


Fig. 6

Or

16. (a) For the circuit shown in Fig. 7, obtain the voltage across each current source, using superposition theorem.

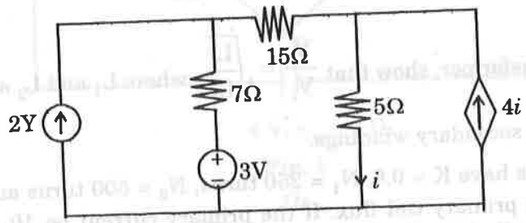


Fig. 7

(b) Determine the values of I_1 and I_2 in Fig. 8 using mesh analysis (KVL)

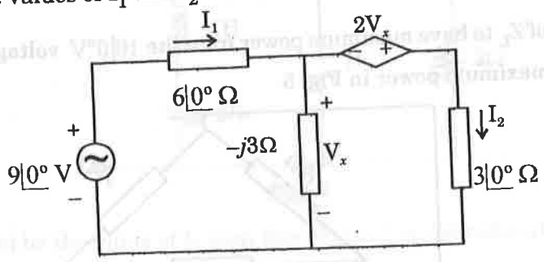


Fig. 8

MODULE 4

17. (a) A symmetrical 220 V, 3-phase system supplies a star connected load with the branch impedances :

$Z_R = 10\underline{|0°}\ \Omega,\ Z_Y = 10\underline{|60°}\ \Omega,\ Z_B = 10\underline{|60°}\ \Omega$.

Calculate the voltage drop across each branch and the potential of the neutral point to earth. The phase sequence is RYB.

(8 marks)

(b) A 3-wire, 3-phase supply feeds a load consisting of 3 equal resistors. By how much is the load reduced if one of the resistors is removed, if the load is delta connected.

(4 marks)

Or

18. The currents in RY, YB and BR branches of a delta connected system with symmetrical voltages are 25 A at p.f. 0.8 lagging, 30 A at p.f. 0.65 leading and 20 A at u.p.f. respectively. Determine the current in each line. The phase sequence is RYB. Also find the balanced delta connected resistors which would take the same power from the above source.

MODULE 5

19. The reduced incidence matrix of a graph is given below. Draw the graph and obtain the fundamental loop and fundamental cut-set matrices. Also verify the results by obtaining mathematically.

Or

20. For the circuit shown in Fig. 9, write the PSPICE input file to obtain the voltage across R_L and current through R_1 when the input voltage varies from 0 to 100 V.

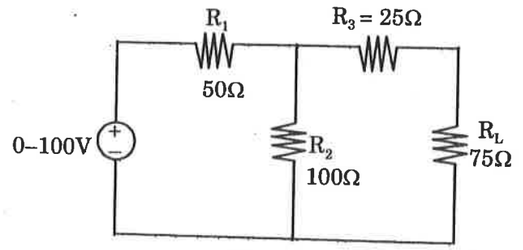


Fig. 9

(5 × 12 = 60 marks)