Hall Ticket Number :										

R-15

Code: 5G232

II B.Tech. I Semester Supplementary Examinations May 2019

Electrical Machines-I

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Explain why equalizer connections are used in lap windings and dummy coils are sometimes used in wave winding?

   b) Elucidate the principle of energy conversion of electromechanical system?

OR

2. a) Define the following terminology of armature winding of a dc machine
   (i) Conductor. (ii) Turn. (iii) Coil & Coil-side. (iv) Coil Span.

   b) Differentiate between progressive winding and retrogressive winding.

UNIT–II

3. a) Derive an equation for EMF in a DC machine.

   b) An 8-pole DC generator has per pole flux of 40 Wb and winding is connected in lap with 960 conductors. Calculate the generated emf on open circuit when it runs at 400 rpm. If the armature is wave wound at what speed must the machine be driven to generate the same voltage.

OR

4. a) Derive the expressions for demagnetizing and cross magnetizing ampere turns per pole.

   b) What are different losses that occur in DC machines? Briefly explain.

UNIT–III

5. What is the experimental procedure to obtain the load characteristics of dc shunt generator? Explain.

OR

6. What is the procedure to connect two series generators in parallel

UNIT–IV

7. a) Explain the significance of back emf in a DC motor.

   b) Explain the working principle of a starter suitable for high speed control of a dc shunt motor with neat sketch.

OR

8. a) From fundamentals derive the torque equation of a DC motor

   b) Identify the DC motor with the highest starting torque. Assess the reason with relevant equation?

UNIT–V

9. a) Describe the back to back test in detail with advantages and disadvantages?

   b) In a brake test on a dc shunt motor, the effective load on the pulley was 13kg, the effective diameter of the pulley was 46cm, the speed 1400rpm, the armature current 23A, when the supply voltage is 220V.Calculate the efficiency of the motor at this load when field resistance is 110 ohms.

OR

10. a) Hopkinson's test on two shunt machines gave the following results for full loads line voltage 250V, line current excluding field currents 50A, motor armature current 380A, field currents of generator and motor are 5A and 4.2A. Calculate the efficiency of each machine. Armature resistance of each machine is 0.02 ohms.

    b) Explain the experimental procedure to conduct 'Brake Test' on a dc shunt machine with the help of connection diagram.

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Hall Ticket Number :										

R-15

Code: 5G234

II B.Tech. I Semester Supplementary Examinations May 2019

Electromagnetic Fields

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) State and explain vector form of Coulombs law? 4M

   b) Derive the expression for Electric Field intensity and potential at a point P which is situated h meter away from the disc along its axis. The disc is charged uniformly with a charge density of ρ_s C/m^2. 10M

OR

2. a) Derive the expression for energy density in an electrostatic field. 7M

   b) Point charges 1 mC and -2 mC are located at (3,2,-1) and (-1,-1,4),respectively. Calculate the electric force on a 10 nC charge located at (0,3,1) and the electric field intensity at that point. 7M

UNIT–II

3. a) Derive the expression for the energy stored in a parallel plate capacitor 8M

   b) Determine the capacitance of a capacitor consisting of two parallel metal plates of 30 cm X30 cm surface area, separated by 5 mm gap in air. What is the total energy stored by the capacitor if the capacitor if the capacitor is charged with 500 V? What is the energy density? 6M

OR

4. a) Define Dipole and Dipole moment? Derive the expression for potential due to dipole? 7M

   b) Explain Polarization of dielectric materials? 7M

UNIT–III

5. a) Obtain an expression for Magnetic field intensity due to an infinitely long current carrying conductor? 7M

   b) Derive the expression for Vector Magnetic Potential. 7M

OR

6. A uniform solenoid 100 mm in diameter and 400 mm long has 100 turns of wire and a current of I=3A.Find the magnetic field on the axis of the solenoid a) At the center b) At one end c) Half way from the center to one end. 14M

UNIT–IV

7. a) Derive the expression for energy stored in a magnetic field. 7M

   b) Derive the self-inductance of a solenoid 7M

OR

8. a) What is a magnetic dipole? How does it differ from an electric dipole? 7M

   b) Derive the expression for inductance of a solenoid using Amperes circuital law. 7M

UNIT–V

9. a) Distinguish clearly the dynamically induced EMF and statically induced EMF explain with neat diagram. 7M

   b) Find the EMF developed around a circular path with radius r=0.5m in the plane z=0 at t=0 if(i) B=0.1 sin(377t)a_z,(ii) B=0.1sin(377t/r)a_r. 7M

OR

10. Compare and Contrast Electric and Magnetic Fields? 14M

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Hall Ticket Number :										

R-15

Code: 5G539

II B.Tech. I Semester Supplementary Examinations May 2019

Fluid Mechanics and Hydraulic Machines

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Differentiate between simple and differential type of manometers.

   b) A thin flat plate of size 80 cm by 50 cm is moved horizontally between two horizontal plane boundaries at a distance of 2 cm from the top boundary and 3cm from the lower boundary. The viscosity of fluid above plate is 1.56 poises and the viscosity of fluid below the plate is 2.83 poises. What force is required to drag the plate at a horizontal velocity of 30 cm/s?

OR

2. a) Derive the one dimensional continuity equation for a stream tube.

   b) Classify the flows of fluids. Mention practical example for each type of flow

UNIT–II

3. a) Derive Bernoulli's equation. Mention its applications.

   b) A pipe of 0.6m diameter is1.5km long. In order to augment the discharge, another pipe of the same dia is introduced parallel to the first in the second-half of the length. Neglecting minor losses, find increase in discharge if friction factor is 0.04. Assume a level difference of 30m at inlet & outlet of the pipe.

OR

4. a) Explain Hydraulic Gradient Line and Total Energy Line

   b) A 300 mm diameter pipe carries water under a head of 20 meters with a velocity of 3.5 m/s. If the axis of the pipe turns through 45^0, find the magnitude and direction of the resultant force at the bend.

UNIT–III

5. a) State the equation used to find out the impact of jet on vanes.

   b) A jet of water 20cm in diameter and moving with a velocity of 20m/sec impinges normally on a series of flat vanes mounted on the periphery of a wheel. If the velocity of the vanes is 8m/sec, determine

   i) The force exerted by the jet on the wheel, ii) work done by the jet on the wheel per second and iii) hydraulic efficiency.

OR

6. a) What are the types of hydroelectric power plants? Describe elaborately about pumped storage plants.

   b) The following details pertain to a hydropower plant. What is power developed in Kw. Available head=130 m, Catchment area=220Km^2 , Annual average rainfall=150cm Percolation and evaporation losses=18% ,Turbine efficiency=86%,Generator efficiency=91%

UNIT–IV

7. a) A Francis turbine is required to give an output power of 15000 KW while working under a head of 14 cm and a speed of 300 rpm. Calculate the guide vane and runner angles and the leading dimensions of the runner. Assume overall efficiency = 80, speed ratio= 0.75, flow ratio = 0.15, ratio of outer to inner diameters = 0.6 and percent flow area blocked by runner vanes thickness =4

   b) Explain the concept of Cavitation in Hydraulic Turbine and List out the different measures that are usually adopted to combat the effect of cavitation

OR

8. a) Draw a neat sketch of a Pelton Turbine and briefly indicate the functions of each component.

   b) Determine the appropriate scale ratio for a Kaplan turbine model to work under a head of 5 m and use water at the rate of 1.96 m3 /s. The prototype machine works under a head of 15 m and produces a power of 30,000 metric H.P. with a specific speed of 850. Assume that the model and prototype have same overall efficiency of 90%. Calculate the speed and power output of the model.

UNIT–V

9. a) Define a centrifugal pump. Explain the working of a single-stage centrifugal pump with sketches.

   b) The internal and external diameters of the impeller of a centrifugal pump are 30 cm and 60 cm respectively. The pump is running at 1000 r.p.m. The vane angles at inlet and outlet are 200 and 300 respectively. The water enters the impeller radially and velocity of °ow is constant. Determine the work done by the impeller per unit weight of water.

OR

10. a) What is NPSH? How will it relate to the working of a centrifugal pump?

    b) A single acting reciprocating pump having a bore of 150mm and a stroke of 300 mm is raising water to height of 20m above the sump level. The pump has an actual discharge of 0.0052 m3/sec. The efficiency of the pump is 70%. If the speed of the pump is 60 rpm, determine

    i. Theoretical discharge ii. Theoretical power iii. Actual power and iv. Percentage slip.

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Hall Ticket Number :										

R-15

Code: 5GC32

II B.Tech. I Semester Supplementary Examinations May 2019

Mathematical Methods-III

(Common to EEE & ECE)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Solve the equations 3x + y + 2z = 3, 2x -3y - z = - 3 , x + 2y + z = 4 using Guass elimination method

   b) Prove that the eigen values of a triangular matrix are just the diagonal elements of the matrix.

OR

2. a) Define Rank of a Matrix. Reduce the matrix $\begin{bmatrix} 2 & 1 & -3 & -6 \\ 3 & -3 & 1 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}$ to the normal form and hence find its rank.

   b) Discuss for values of ª and « the simultaneous equations $x + y + z = 6$; $x + 2y + 3z = 10$; $x + 2y +$ ª $z =$ « have (i) unique solution, (ii) no solution and (iii) infinite number of solutions

UNIT–II

3. a) Using the bisection method, find a real root of the equation $\cos x = xe^x$ correct to three decimal places.

   b) Using Modified Euler's method find an approximate value of y when $x = 0.3$. Given that $\frac{dx}{dy} = x + y$ and $y = 1$ when $x = 0$

OR

4. a) Find a real root of the equation $3x = \cos x + 1$ by Newton-Raphson method correct to four decimal places.

   b) Apply Runge-Kutta method to find an approximate value of y when $x = 0.2$ if $\frac{dx}{dy} = x + y$ given that $y = 1$, where $x = 0$.

UNIT–III

5. a) Find f(2.5) using Newton's forward formula from the following data.

x	0	1	2	3	4	5	6
f(x)	0	1	16	81	256	625	1296

   b) Use Simpson's rule to find $\int_0^{0.6} e^{-x^2} dx$ by taking seven ordinates.

OR

6. Use Trapezoidal rule and Simpson's $\frac{1}{3}$ rule to estimate $\int_0^1 \frac{1}{1+x^2} dx$

UNIT–IV

7. a) Fit a straight line by the method of least squares method to the following data

x	1	2	3	4	5
y	14	27	40	55	68

b) Form the partial differential equations (by eliminating the arbitrary constants and arbitrary functions) from

$(i)\ z = a\,x + b\,y + a^2 + b^2$ and $(ii)\ z = f(x + a\,y) + g(x - a\,y)$

OR

8. Solve by the method of separation of variables $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ and $u(x,0) = 6e^{-3x}$.

UNIT–V

9. a) Find the half range cosine series for $f(x) = x^2$ in the range $0 \le x \le ®$

b) Find the sine and cosine transform of $f(x) = \begin{cases} \sin x, 0 < x < a \\ 0, x \ge a \end{cases}$

OR

10. If $f(x) = \begin{cases} 0, -® \le x \le 0 \\ \sin x, 0 \le x \le ® \end{cases}$, prove that $f(x) = \frac{1}{®} + \frac{\sin x}{2} + \frac{2}{®}\sum_{n=1}^{\infty}\frac{\cos 2nx}{4n^2 - 1}$ and hence show that i) $\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + - - - + \infty = \frac{1}{2}$

ii) $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - - - - + \infty = \frac{1}{4}(® - 2)$

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Hall Ticket Number :										

R-15

Code: 5G231

II B.Tech. I Semester Supplementary Examinations May 2019

Switching Theory and Logic Design

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Convert the following numbers into decimal:
   i. 100100111000.0111(BCD)
   ii. $(11001101.111)_2$
   iii. $(CF.5)_{16}$
   iv. $(234)_5$ 10M

   b) Explain with examples, how Hamming code is useful for detecting and correcting errors in digital data transmission. 4M

OR

2. a) i.) Perform the **45+(-17)** subtraction using 1's complement and 2's complement method. Find the result in sign-magnitude.
   ii.) What is the radix called in case of Decimal, binary, octal and hexadecimal number system? 7M

   b) Find the Excess-3 code and its 9's complement for the following decimal numbers: i. 56, ii. 812 7M

UNIT–II

3. a) Simplify the following function using K-map and implement it using basic gates only. $f(A,B,C,D) = \sum_m (2,3,5,13,14) + d(8,9,10,11)$ 7M

   b) Simplify the following Boolean function to POS form.
   $f(w,x,y,z) = \sum (0,1,2,5,8,10,13)$ 7M

OR

4. a) Minimize the given expression using K-map and also show the essential prime implicants and selective prime implicants on the K-map.
   $Y(A,B,C,D) = \sum_m (4,5,7,12,14,15) + \sum d(3,8,10)$ 7M

   b) Use the tabular procedure to simplify the given expression
   $f(v,w,x,y,z) = \sum_m (0,4,12,16,19,24,27,28,29,31)$ 7M

UNIT–III

5. a) Implement the following function using an 8:1 MUX
   $F(A,B,C) = \overline{A}B + C\overline{D} + A\overline{C}.$ 7M

   b) Realize two outputs F1 and F2 using 4X2 PROM
   $F_1(A_1, A_0) = \sum_m (0,2)$
   $F_2(A_1, A_0) = \sum_m (0,5,6,7)$ 7M

OR

6. a) Implement the following logic function using an 8X1 MUX
$F(AB,C,D) = \sum_m (1,3,4,11,12,13,14,15)$. 7M

   b) Compare the three combinational PLDs. 7M

UNIT–IV

7. a) What are the applications of flip-flops? 2M

   b) Design a mod-7 synchronous counter using S-R flip-flops. 12M

OR

8. a) What is twisted ring counter? Write the advantages and disadvantages of ring counter compared to ripple counter 4M

   b) Design 3-bit counter which counts in the following sequence
$0 \to 2 \to 5 \to 3 \to 4 \to 0 \to 2 \to .....etc$ 10M

UNIT–V

9. a) What are the capabilities and limitations of finite state machines? 2M

   b) Find the equivalence partition and corresponding reduced machine in standard form for the machine given below.

PS	NS,Z	
	X=0	X=1
A	***E,0***	***D,1***
B	***F,0***	***D,0***
C	***E,0***	***B,1***
D	***F,0***	***B,0***
E	***C,0***	***F,1***
F	***B,0***	***C,0***

12M

OR

10. a) Define the “State equivalence and machine equivalence” with reference to sequential machines. 2M

   b) What are the conditions for two machines to be equivalent? for the machine given in table, find the equivalence partition and corresponding reduced machine in standard form.

PS	NS,Z	
	X=0	X=1
A	***F,0***	***B,1***
B	***G,0***	***A,1***
C	***B,0***	***C,1***
D	***C,0***	***B,1***
E	***D,0***	***A,1***
F	***E,1***	***F,1***
G	***E,1***	***G,1***

12M

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Hall Ticket Number :										

R-15

Code: 5G233

II B.Tech. I Semester Supplementary Examinations May 2019

Electrical Circuits – I

(Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Discuss the concept of source transformation technique. 7M

   b) Find the equivalent resistance between the terminals Y and Z in Fig.1. 7M

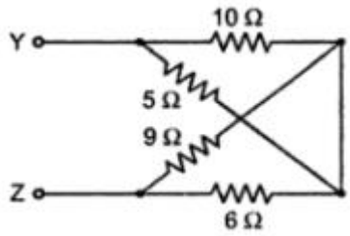

Fig.1

OR

2. a) Explain the following terms with reference to network topology with an example. 8M
   i. Twig
   ii. Link
   iii. Oriented graph
   iv. Incident matrix

   b) Write the properties of tie-set matrix and cut-set matrix 6M

UNIT–II

3. a) Show that resonant frequency ω_n of RLC series circuit is geometric mean of lower and upper half-frequencies ω_1 and ω_2 7M

   b) With respect to series resonant circuit, prove that bandwidth is inversely proportional to the Q-factor at resonance. 7M

OR

4. a) Define the following: 8M
   i) Amplitude of an alternating quantity
   ii) Instantaneous value of an alternating quantity
   iii) Frequency
   iv) Phase

   b) Discuss about Power triangle and power factor in ac circuits. 6M

UNIT–III

5. a) State and prove the superposition theorem with the help of an example. 7M

   b) Find R_{AB} in Fig.2, for maximum power transfer. Also calculate maximum power.

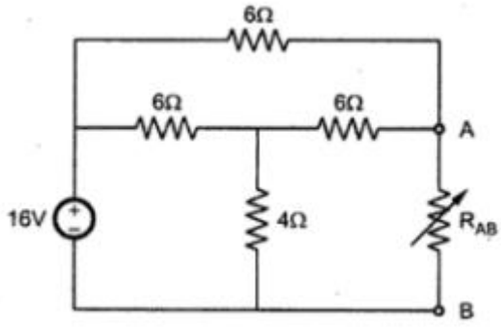

Fig.2 7M

OR

6. Find the Thevenin equivalent circuit for the circuit shown below Fig.3. 14M

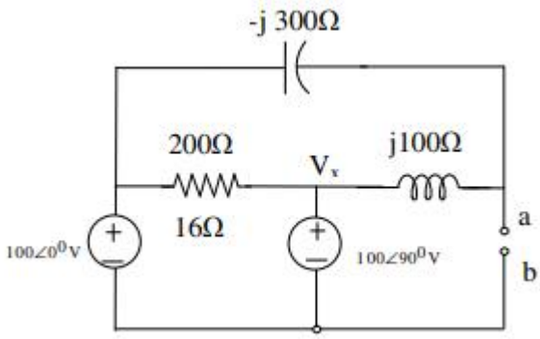

Fig.3

UNIT–IV

7. Find the Y-parameters for the two port network shown in fig.4 14M

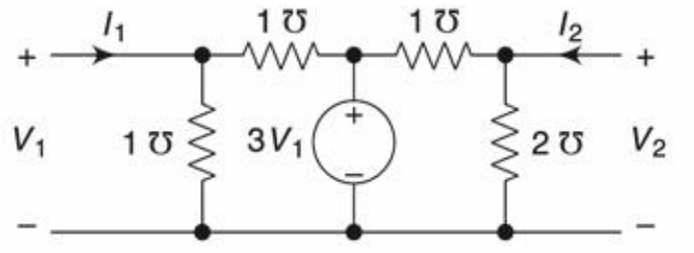

Fig.4

OR

8. a) Obtain the *z* -parameters for the network in Fig.5 8M

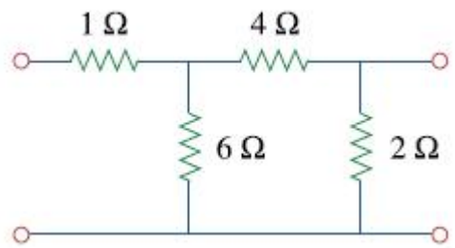

Fig.5

b) Determine the h-parameters with the following data:

(i) With the output terminals short circuited, V_1=25V, I_1=1A, I_2=2A

(ii) With the input terminals open circuited, V_1=10V, V_2=50V, I_2=2A 6M

UNIT–V

9. a) Derive the relation between self inductance, mutual inductance and coefficient of coupling. 7M

b) A magnetic circuit consists of an iron ring of mean circumference 80 cm with cross-sectional area of 12 cm2 throughout. A current of 2A in the magnetising coil of 200 turns produce a total flux of 1.2 mwb in the iron. Calculate: i) the flux density in the iron ii) the absolute and relative permeability of iron. iii) the reluctance of the circuit. 7M

OR

10. a) Explain the importance of dot convention in coupled circuits. 6M

b) Define: (i) Flux (ii) m.m.f (iii) Reluctance (iv) Magnetic field intensity. 8M

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