QP code: 10082085C

SE sem IV Electrical R-19 C scheme

(3 Hours)   Total Marks: 80

N.B: (1) Question No. 1 is compulsory.
     (2) Attempt any three from the remaining questions.
     (3) Figures to the right indicate full marks.
     (4) Each question is of 20 Marks

Q.1	Attempt any 4 questions	
A	Explain the general block diagram of electric vehicle.	5
B	Elaborate on the concept of G2V.	5
C	Explain the performance parameter of the motors used in Electric vehicle.	5
D	List the importance of ultracapacitors in EV/ HEV.	5
E	What is hybridness? List the classification of hybridness in HEV.	5

Q.2		
A	Elaborate on the architecture of parallel hybrid electric drive train. List down the advantages, disadvantages and applications	10
B	Compare and Differentiate between the battery electric vehicle (BEV), Hybrid Electric Vehicle (HEV) and plug in hybrid Electric Vehicle (PHEV), with neat, labelled block diagrams.	10

| Q.3		
A	Explain the power characteristics of motor and ICE used in EV/HEV	10
B	State and define the key battery parameters (i) Battery capacity (ii) C rate (iii) SoC (iv) DoD (v) Specific Energy (vi) Energy Density	10

Q.4		
A	Classify the different EV battery charging methods. Explain in brief.	10
B	Derive the Peukert's education. Give its importance. Calculate the capacity of lead Acid Battery if the charging time is 5 hrs with a current of 10 amps. The peukert condtant is 1.3.	10

Q.5		
A	Describe in detail all modes of operation for series-parallel hybrid vehicle.	10
B	Classify the different types of AC motors used in EV/HEVs. Explain each in brief.	10

Q.6		
A	Classify Energy Management Strategies. Explain Rule based energy management strategies.	10
B	Explain why hybridization of energy sources is important for EV/HEV.	10

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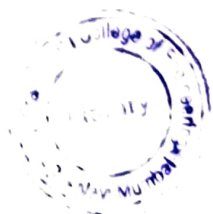
SE sem IV Electrical R-19 C scheme

Duration: 3hrs

[Max Marks: 80]

Note: 1) Question No. 1 is compulsory
2) Attempt any three questions out of remaining five
3) All Questions carry equal marks
4) Assume suitable data if required and state it clearly

Q1 Attempt any FOUR [20]
a. Explain significance of free-wheeling diode. [5]
b. Compare power BJT, MOSFET and IGBT [5]
c. Explain need of Heat Sink in PE circuits [5]
d. Define Latching and Holding current. [5]
e. Give applications of DC to DC converter. [5]
f. Explain any one forced commutation circuit [5]

Q2. a) Defined different performance parameters of single-phase bridge inverter. [10]
b) Draw and explain PWM techniques for the control of output voltage of Inverters. [10]

Q3. a) Draw and explain 3-phase full bridge converter and draw following wavwforms for α=30° 1.
supply voltage, 2. firing pulses, 3. Load voltage for resistive load. [10]
b) What is a safe operating area of a semiconductor switch? How is the conduction and switching
loss calculated? [10]

Q4. a) Draw and explain single phase full Dual converter. [10]
b) Explain different protection techniques of SCR in detail. [10]

Q5. a) Draw and explain Buck regulator with waveforms and derive the relation for output voltage. [10]
b) Draw and explain 3 phase inverter in 120^0 mode of operation [10]

Q6. Write short notes on (**any two**) [20]

a) Two-transistor's analogy of SCR
b) Gate triggering circuits of SCR
c) Bootstrap driver circuit

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Duration: 3 Hours   **Marks: 80**

Note:
1.   Question No. 1 is compulsory.
2.   Attempt any three questions out of the remaining five questions.
3.   Assume suitable data wherever necessary.
4.   Figures to the right indicate full marks.

1	Answer any FOUR questions	**[20]**
a	Convert 25.45 decimal number to equivalent binary, hexadecimal, octal numbers.	**[5]**
b	Using the truth table, prove that $AB + \bar{A}B + \bar{A}\bar{B} = \bar{A} + B$	**[5]**
c	Given the logic $Y = (A + BC)(B + \bar{C}A)$, reduce it using Boolean theorem and realize using NAND gates.	
d	Differentiate between combinational circuit and sequential circuit with the help of suitable examples for each.	**[5]**
e	Discuss various specifications of Digital to analog converter.	**[5]**
e	List the difference between random access memory and read only memory.	**[5]**
2 a	Explain BCD code, excess 3 code and gray code. Tabulate these three code for 4 bits binary number. Explain the concept of negative numbers in binary number system	**[10]**
b	What are different logic families? Explain RTL logic based OR gate with the help of suitable diagram.	**[10]**
3 a	Realize the logical f(A, B,C,D)=Σm(0,1,4,5,7,9,11,12,14) +d(2,8,13) using NAND gate after minimizing by K-map	**[10]**
b	Realize the logic circuit for half adder, full adder, half subtractor and full subtractor using K map.	**[10]**
4 a	Explain the mode and state of counter. Design and explain the working of mode 10 asynchronous upcounter.	**[10]**
b	Design a 3 bits synchronous counter and explain the working with the help of suitable diagrams.	**[10]**
5 a	Design and explain a 4 bits parallel in serial out shift register with the help of suitable diagrams.	**[10]**
b	Explain the application of ROM as programmable logic device	**[10]**
6 a	Explain the output of a 4 bits R-2R type DAC if the digital input is 1010. Use suitable diagrams wherever applicable.	**[10]**
b	Explain working of dual slope ADC with the help of suitable diagrams. Explain its advantages	**[10]**

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Total Marks: 80

(3 Hours)

N.B: (1) Question No. 1 is compulsory.
    (2) Attempt any three from the remaining questions.
    (3) Figures to the right indicate full marks.
    (4) Each question is of 20 Marks.

Q. 1	**Answer any four questions.**	**20M**
a.	List out the conditions for successful parallel operation of two single phase transformers.	5M
b.	Explain the necessity of starter in case of a three phase induction motor?	5M
c.	State and explain the advantages and disadvantages of autotransformer	5M
d.	Describe connection and phasor diagram of yy0 and yd11 transformer.	5M
e.	Why single-phase induction motor is not self-starting.	5M

Q. 2	**Answer following questions.**	**20M** '5'
a.	A 3-phase Induction Motor 50 Hz, 4 pole, having a rating of 18.65 kW has friction and windage losses of 2.5% of the output. The full load slip is 4%. Find for full load (i) the rotor Cu. Loss (ii) the rotor input (iii) the shaft torque (iv) the gross electromagnetic torque.	10M
b.	Discuss various speed controlling methods for 3 phase induction motor. Explain any one in detail.	10M

Q. 3	**Answer following questions.**	**20M**
a.	Discuss the torque-speed characteristics for all operating regions of a three phase induction motor.	10M
b.	Explain working of shaded pole single phase induction motor with the help of phasor diagram, and Also explain the operating characteristics.	10M

Q. 4	**Answer following questions.**	**20M**
a.	Describe the phenomenon of double field revolving theory in single phase induction motor.	10M
b.	Describe harmonics and Suppression of harmonics in three phase transformer.	10M

Q. 5	**Answer following questions.**	**20M**
a.	Write a short note on Oscillating neutral phenomenon.	10M
b.	Explain O.C. and S.C. test of a single phase transformer with equivalent circuit.	10M

Q. 6	**Answer following questions.**	**20M**
a.	A 100 KVA, 2200/440 V transformer has $R_1 = 0.3 \ \Omega$, $X_1 = 1.1\Omega$, $R_2 = 0.01\Omega$, $X_2 = 0.035\Omega$. Calculate (i) the equivalent impedance of transformer referred to the primary and (ii) total copper losses.	10M
b.	Discuss excitation Phenomenon in transformers.	10M

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Q.4 (a) If X and Y are independent random variable with $E(X) = 6$ and (6)
$E(Y) = -6$, $V(X) = 4$, $V(Y) = 9$ then find
i) $E(2X + 3Y - 2)$
ii) $V(3X + 2Y + 2)$

(b) Evaluate $\int\limits_{0}^{1+i} (x - y + ix^2)\, dz$ along the line from $z = 0$ to $z = 1 + i$. (6)

(c) Find rank, index, signature and nature of the Quadratic form by reducing it into (8)
Canonical form by congruent transformation $x^2 + 3y2 + 3z^2 - 2yz$.

Q.5 (a) Three factories A, B, C produce 30%, 50% and 20% of the total production of (6)
an item. Out of their production 80%, 50% and 10% are defective respectively.
An item is chosen at random and found to be defective. Find the probability
that it was produced by the factory A.

(b) A continuous random variable has pdf $f(x) = k(x - x^2), 0 \le x \le 1$. Determine k, (6)
mean, and variance.

(c) Using Rayliegh -Ritz method solve boundary value problem (8)
$\int_0^1 (2x^2 y - 4y^2 + y'^2)dx$, y(0)=0 , y(1)=0.

Q.6 (a) (6)

x	65	66	67	67	68	69	70	72
y	67	68	65	68	72	72	69	71

Calculate the Karl Pearson's coefficient of correlation.

(b) Find the extremals of $\int_a^b (16y^2 - y''^2 + x^2)dx$. (6)

(c) Given: $6y = 5x + 90$, $15x = 8y + 130$ are regression lines and $\sigma_x^2 = 16$ (8)
then find (i) mean of X and Y (ii)correlation coefficient (r) (iii)σ_y^2.

XAI3VI3ECEEXAI3VI3ECEEXAI3VI3ECEEXAI3VI3ECEE

QPcode: 10083229

SE Sem IV R-19 CScheme Electrical

(3 Hours)   **[Total Marks: 80]**

N.B.: 1) Question No. **1** is **Compulsory**.

     2) Answer **any THREE** questions from Q.2 to Q.6.

     3) Figures to the right indicate full marks.

Q.1   (a)   Find (i) k (ii) mean and variance of the following distribution   (5)

X	8	12	16	20	24
P(X)	1/12	5/12	k	1/4	1/12

   (b)   Evaluate $\int_c (x - iy^2)dz$ where c is curve $x = y^2$ from point (0,0) to (1,1).   (5)

   (c)   Find the extremal of $\int_0^{3\pi/2}(y^2 - y'^2)dx$ where y(0)=0 ; y(3π/2)=1   (5)

   (d)   State and verify the Cauchy Schwarz for the vectors (2, 1, 1,-1) and (1,-2, 1, 1).   (5)

Q.2   (a)   Evaluate $\int_c \frac{z}{(z^2+3z+2)}dz$, where c is the circle $|z + 1| = 1/2$.   (6)

   (b)   Fit the second degree polynomial for following data   (6)

Price(X)	20	16	10	11	16
Demand(Y)	22	41	120	89	56

   (c)   Transform the basis {(1,0,1) ; (1,1,0);(0,1,1)} into orthogonal basis using Gram-Schmidt process.   (8)

Q.3   (a)   Check whether the following sets are subspace of R^3 (6)
           (i)   W=(a ,0,0)/ a belongs toR }
           (ii)   W={(x ,y, z)/x²+y²+z²≤1}

   (b)   Calculate the rank correlation coefficient 'R' for the following data   (6)

x	10	12	18	16	15	40
y	12	18	20	15	50	25

   (c)   Obtain all possible Laurent's series expansion of $f(z) = \frac{1}{z^2+12z+35}$ about $z = 0$.   (8)