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5E1361

Roll No. _____ [Total No. of Pages : 2

5E1361

B.Tech. V- Semester (Main) Examination, November - 2019
ESC Electrical Engg.
5EE3-01 Electrical Materials

Time : 2 Hours **Maximum Marks : 80**

Min. Passing Marks : 28

Instructions to Candidates:

*Attempt **all five** questions from **Part A**, **four** questions out of **six** questions from **Part B** and **two** questions out of **three** from **Part C**. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.*

PART - A

(Answer should be given up to **25** words only)

All questions are **compulsory** **(5×2=10)**

1. Define and explain magnetic domain in ferromagnetic materials? **(2)**
2. Define diffusion current in a semiconductor? **(2)**
3. What is meant by polarisation? **(2)**
4. What is crystalline state? State their defects. **(2)**
5. Explain briefly carrier density and energy gap in semi conductor? **(2)**

PART - B

(Analytical/Problem solving questions)

Attempt any **four** questions **(4×10=40)**

1. Discuss the effects of 'temperature' and 'frequency of applied field' on the dielectric constant of materials. **(10)**
2. Define piezoelectricity. Explain the uses of any three piezoelectric materials. **(10)**
3. Explain the effect of critical magnetic field, critical current and isotopic mass on critical temperature of a super conducting material. **(10)**
4. Enumerate different types of semi conductors show that the fermi level for a pure germanium lies in the middle of its forbidden gap. **(10)**

5. Define Hall effect with necessary sketch. Explain the concept of Hall effect and arrive at an equation for hall voltage V_H. **(10)**

6. What is Curie law, Curie temperature and Curie Weiss law explain? **(10)**

PART - C

(Descriptive/Analytical/Problem Solving/Design Question)

Attempt any **two** questions **(2×15=30)**

1. Draw a typical hysterisis loop for a ferromagnetic material. Show which part is reversible and which is not. Define residual magnetism and coercive force. How are all these properties explained in terms of the microscopic structure of the solid. **(15)**

2. a) List of characteristics of good insulating material. **(5)**

   b) A parallel plate capacitor has an area of 8 cm^2 with a separation of 0.08 mm. The space is filled with polysterone. the real part of relative dielectric constant is 2.56 and the loss tangent 0.7×10^{-14} at a frequency of 1MHz. Calculate the capacitance and parallel loss resistance. **(10)**

3. a) What is atomic packing factor? Calculate its value for simple cube and body centered cube. **(7)**

   b) Describe in brief the basic seven crystal system? What is meant by imperfections in a crystal? **(8)**

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5E1365

Roll No. _____ [Total No. of Pages : 2

5E1365

B.Tech. V- Semester (Main) Examination, Nov.- 2019
PCC/PEC Electrical Engg.
5EE4-05 Electrical Machine Design

Time : 3 Hours **Maximum Marks : 120**
Min. Passing Marks : 42

Instructions to Candidates:

*Attempt **all ten** questions from **Part A**, **five** questions out of **Seven** from **Part B** and **Four** questions out of **Five** from **Part C**. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.*

PART - A

(Answer should be given up to **25** words only)

All questions are **compulsory** **(10×2=20)**

1. How is iron loss reduced in transformers? **(2)**
2. List of the advantages of using open slots. **(2)**
3. What are the factors that affecting the size of rotating machines? **(2)**
4. What is cogging? How is it avoided in Induction motor? **(2)**
5. Mention various duty cycles of motor. **(2)**
6. Give the purpose of providing damper windings in synchronous machines. **(2)**
7. What are the different types of heat transfer methods found in electrical machines? **(2)**
8. Write short notes on FEM. **(2)**
9. Define specific electric loading. **(2)**
10. Explain synthesis and hybrid methods. **(2)**

PART - B

(Analytical/Problem solving questions)

Attempt any **five** questions **(5×8=40)**

1. State and derive the KVA output equation of single phase transformer. **(8)**
2. Derive the expression for output equation of Inductor motor. **(8)**

3. Explain the construction of synchronous machine with neat diagrams. **(8)**

4. State and explain the specific magnetic loading and the choice of magnetic loading. **(8)**

5. A 3 phase, 4 pole, 50 Hz induction motor has 24 stator slots and 28 rotor slots Prove that it has a tendency to run as a synchronous motor at 214.3 rpm. **(8)**

6. Define the short circuit ratio in connection with 3 phase synchronous generator. Explain the factors affecting by short circuit ratio. **(8)**

7. Explain SRM? What are the different power controllers used for the control of SRM. **(8)**

PART - C

(Descriptive/Analytical/Problem Solving/Design Question)

Attempt any **Four** questions **(4×15=60)**

1. A 100 KVA, 3300 V, 50 Hz, 300 rpm, 3 phase alternator has 180 slots with 5 conductors per slot, single layer winding with full pitched coil is used. The winding is star connected with one circuit per phase. Determine the specific electric loading and magnetic loading if the stator bore is 2.0 m and the core length is 0.4 m. Using the same loading, determine corresponding data for a 1250 KVA, 3300 V, 50 Hz 250 rpm, 3 phase star connected alternator having 2 circuit per phase The machine has 60^{o} phase spread. **(15)**

2. Estimate the main dimensions including winding conductor area of a 3 phase delta-star core type transformer rated at 300 KVA 6600/440 volt. 50 Hz. A suitable core with 3 steps having circumscribing circle of 0.25 m diameter and leg spacing of 0.4 m is available. Emp per turn = 0.5 volt, current density = 2.5 A/mm^2, k_w = 0.28, stocking factor = 0.9. **(15)**

3. a) Derive the expressions for design of rotor and end rings of squirrel cage. **(10)**

   b) Explain the methods of improving the starting torque in I.M. **(5)**

4. a) Write a short note on cooling of transformers. **(5)**

   b) Prove that EMP/Turn of a single phase Transformer = $k\sqrt{Q}$ where Q = per phase KVA output of transformer. **(10)**

5. a) What do you understand by CAD analysis. **(5)**

   b) Explain different approaches used in computer aided design with the help of suitable flowcharts? **(10)**

5E1362

Roll No. _____ [Total No. of Pages : 3

5E1362

B.Tech. V- Semester (Main) Examination, Nov. - 2019
PCC/PEC Electrical Engg.
5EE4-02 Power System - I
(Common for EE,EX)

Time : 3 Hours

Maximum Marks : 120
Min. Passing Marks : 42

Instructions to Candidates:

*Attempt **all ten** questions from **Part A**, **five** questions out of **Seven** from **Part B** and **Four** questions out of **Five** from **Part C**. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.*

PART - A

(Answer should be given up to **25** words only)

All questions are **compulsory** **(10×2=20)**

1. Why transmission lines are 3 phase 3 wire circuits while distribution lines are 3 phase 4 wire circuits?
2. What are standard Transmission and Distribution voltages in India?
3. Why skin effect is absent in DC system?
4. What is difference between feeder and distributor?
5. What is meant by symmetrical fault?
6. What is Ferranti effect?
7. What is the reason for transients during short circuits?
8. What is meant by transposition of line conductors?
9. Define per unit value.
10. What is the drawback in series connected capacitor?

PART - B

(Analytical/Problem solving questions)

Attempt any **five** questions **(5×8=40)**

1. a) Describe the various methods for reducing corona effect in an overhead transmission line.

   b) A 3 - phase, 220kV, 50 Hz transmission line consists of 1.5 cm radius conductor spaced 2 meters apart in equilateral triangular formation. If the temperature is 40°C and atmospheric pressure is 76 cm, calculate the corona loss per km of the line. Take $m_o = 0.85$.

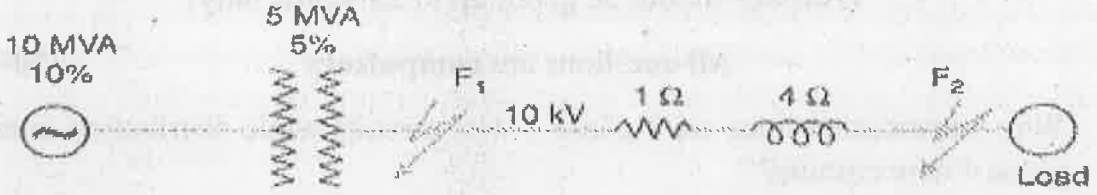
2. Explain different types of distribution systems.

3. Derive an expression for inductance of three phase transmission line.

4. A 3 - phase transmission line operating at 10 kV and having a resistance of 1Ω and reactance of 4Ω is connected to the generating station bus - bars through 5 MVA step - up transformers having a reactance of 5%. The bus - bars are supplied by a 10 MVA alternator having 10% reactance. Calculate the short - circuit kVA fed to symmetrical fault between phases if it occurs

   i) at the load end of transmission line

   ii) at the high voltage terminals of the transformer



5. With the help of block diagrams explain the operations of standalone and grid interactive Solar PV systems.
6. What is a nominal $\pi(\rho i)$ circuit? Find the ABCD constants for nominal π circuit.
7. What is meant by insulation coordination? How are the protective devices chosen for optimal insulation level in power system?

PART - C

(Descriptive/Analytical/Problem Solving/Design Question)

Attempt any **Four** questions **(4×15=60)**

1. a) What is the effect of transmission voltage on line performance? Derive mathematical expressions to validate the answer. **(6)**

   b) A single phase AC system supplies a load of 200 kW. If this system is converted into 3 phase 3 wire AC system by running a third similar conductor then calculate the 3 phase load than can now be supplied if the voltage between the conductor is same. Assume power factor and transmission efficiency to be same in both cases. **(9)**

2. A 3 - phase, 50 Hz transmission line 100 km long delivers 20 MW at 0.9 p.f. lagging and at 110 kV. The resistance and reactance of the line per phase per km are 0.2Ω and 0.4Ω respectively, while capacitance admittance is 2.5×10^{-6} siemen/km/phase. Calculate :

   i) the current and voltage at the sending end

   ii) efficiency of transmission. Use nominal T method. **(15)**

3. a) Derive an expression for fault current for single line - to - ground fault by symmertrical components method. **(7)**

   b) The per unit values of positive, negative and zero sequence reactance of a network at fault are 0.08, 0.07 and 0.05. Determine the fault current if the fault is

      i) double line - to ground

      ii) Line to line

      iii) Line to ground **(8)**

4. a) Write short notes on

      i) Distributed Generation

      ii) Surge Impedance loading. **(2×3=6)**

   b) A 50 hp induction motor has pf 0.9 & 90% efficiency at full load, at half load 0.6 pf and 70% efficiency. At no load the current is 25% of the full load current and 0.1 pf. Shunt capacitors are installed in circuit to make the line pf 0.8 at half load. Determine the line power factor at

      (i) Full load

      (ii) No load. **(9)**

5. a) Discuss merits and demerits of HVDC transmission system. **(7)**

   b) A delta connected load is supplied from a 3 - phase supply. The fuse in the B line is removed and current in the other two lines is 20 A. Find the symmetrical components of line currents. **(8)**

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5E1363

Roll No. _____ [Total No. of Pages : 4

5E1363

B.Tech. V - Semester (Main) Examination, Nov. - 2019
PCC/PEC Electrical Engg.
5EE4-03 Control System
(Common with EE, EX)

Time : 3 Hours **Maximum Marks : 120**

Min. Passing Marks : 42

Instructions to Candidates:

*Attempt **all ten** questions from **Part A**, **five** questions out of **Seven** from **Part B** and **Four** questions out of **Five** from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

PART - A

(Answer should be given up to **25** words only)

All questions are **compulsory** **(10×2=20)**

1. Explain open loop and closed loop control system with examples. **(2)**

2. State and explain D.Alembert's principle. **(2)**

3. Explain different types of mechanical system. **(2)**

4. Briefly explain different type of standard test signals. **(2)**

5. With the help of a block diagram explain time response of a first order control system when the input is a unit step function. **(2)**

6. Derive peak time (t_p) and Rise time (t_r) of transient response of a second order underdamped system. **(2)**

7. Explain the correlation time and frequency domain response. **(2)**

8. Write main features of PID controller. **(2)**

9. A system is described by the following equations

$$\dot{x}(t)=\begin{bmatrix}-1 & 1\\ 0 & -2\end{bmatrix}x(t)+\begin{bmatrix}1 & 0 & 1\\ 0 & 1 & 1\end{bmatrix}u(t) \quad y(t)=\begin{bmatrix}1 & 2\\ 1 & 0\\ 1 & 1\end{bmatrix}x(t)$$

Find the transfer function of the system. **(2)**

10. Explain multi variable control system. **(2)**

PART - B

(Analytical/Problem solving questions)

Attempt any **five** questions **(5×8=40)**

1. Using Mason's gain formula method, determine the ratio C/R for the system represented by the block diagram as shown in fig. 1. **(8)**

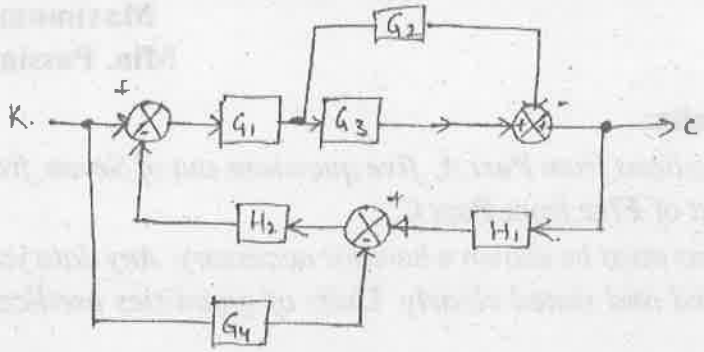


fig. 1

2. Determine the mathematical mode equations for a mechanical system shown in fig. 2 and hence determine the transfer functions relating to $x_1(s)$ to F(s). **(8)**

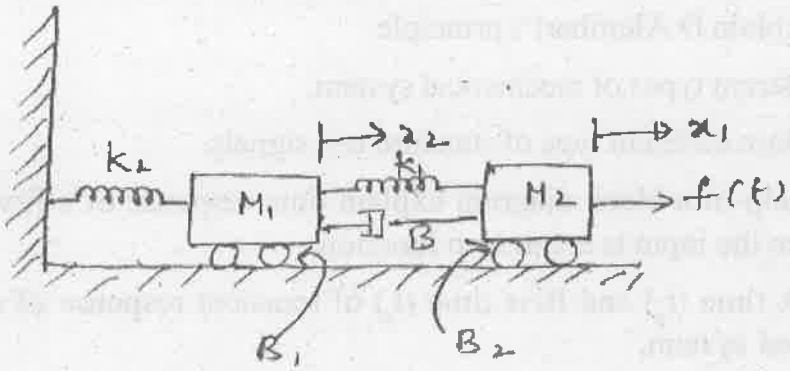


fig. 2

3. A unity feed back servo – driven instrument has an open loop transfer functions.

$$G(s)=\frac{10}{s(s+2)}$$

Find

i) The natural frequency of oscillation (ω_n) and damping ratio (δ).

ii) Maximum overshoot (M_p) and Peak time (T_p)

iii) Steady state error to an input (1+4t). **(8)**

4. Determine the open loop transfer function from the Bode plot shown in fig. 3. **(8)**

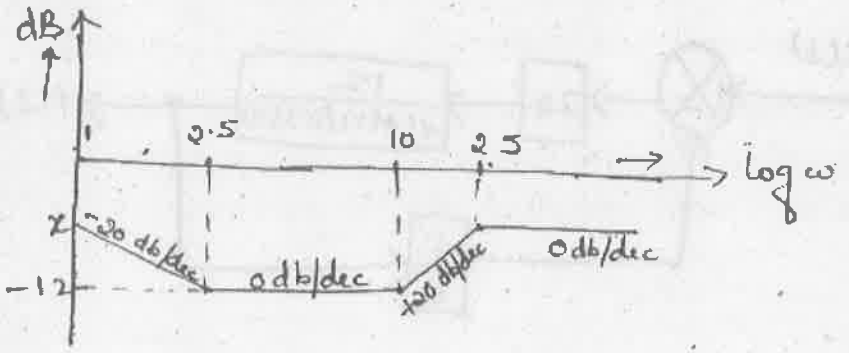


fig. 3

5. A system characterised by the transfer function $y(s)/u(s) = \frac{2}{s^3+6s^2+11s+6}$: Test the controllability and observability of the system. **(8)**

6. Explain all design specifications in frequency Domain. **(8)**

7. Explain optimal control system with suitable example. **(8)**

PART - C

(Descriptive/Analytical/Problem Solving/Design Question)

Attempt any **Four** questions **(4×15=60)**

1. a) Find the transfer function X(s)/E(s) for the electromechanical system shown in fig 4. The coil has a back emf $e_b = k_1 \frac{dx}{dF}$ and the coil current i produces a force $f_t = k_2 i$ on the Mass M. **(12)**

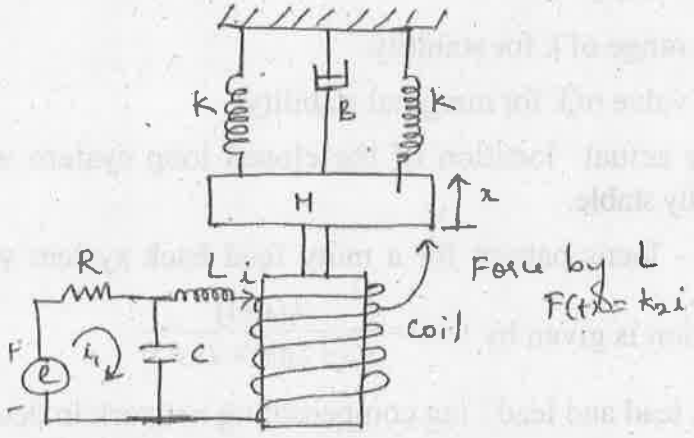


fig. 4 Force by L $F(t) = k_2 i$

b) Specify benefits of Feedback in a control system. **(3)**

2. a) The block diagram of a simple servosystem shown in fig 5. Find

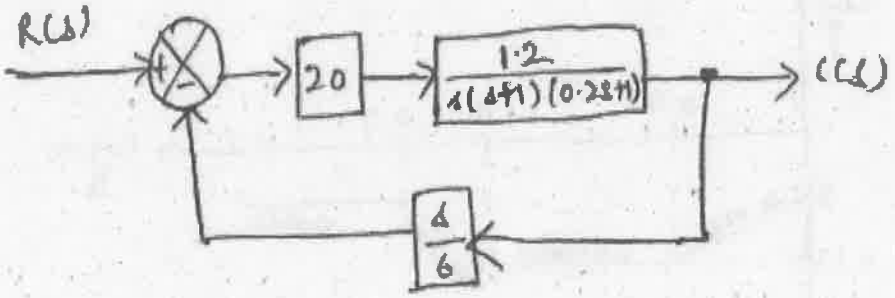


fig. 5

1) The characteristics equation of the system
2) Undamped frequency of oscillations.
3) Damped frequency of oscillations.
4) Damping ratio.
5) Damping factor.
6) Maximum overshoot
7) First undershoot
8) Time interval after which maximum and minimum occurs.
9) Settling time
10) Number of cycles completed before the output is settled within 2% of the final value (consider unit step input) **(11)**

b) Write short notes on Non - Linear control system. **(4)**

3. Using the Routh - Hurwitz criterion and Unity feedback system with $G(s)=\frac{k}{s(s+1)(s+2)(s+5)}$

a) Find the range of k for stability.

b) Find the value of k for marginal stability.

c) Find the actual location of the closed loop system when the system is marginally stable. **(15)**

4. Plot the root - locus pattern for a unity feed back system whose forward path transfer function is given by $G(s)=\frac{k(s+1)}{s(s+2)(s^2+2s+5)}$ **(15)**

5. Compare lag, lead and lead - lag compensating network in detail. **(15)**

Roll No. _____ [Total No. of Pages : 3

5E1366

B.Tech. V- Semester (Main) Examination, Nov. - 2019
HSMC Electrical Engg.
PCC/PEC 5EE5-11 Restructured Power System

Time : 2 Hours **Maximum Marks : 80**
Min. Passing Marks : 28

Instructions to Candidates:

*Attempt **all five** questions from **Part A**, **four** questions out of **six** questions from **Part B** and **two** questions out of **three** from **Part C**. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.*

PART - A

(Answer should be given up to **25** words only)

All questions are **compulsory** **(5×2=10)**

1. Enumerate the need of restructuring of power system.
2. Define Market Clearing Price (MCP) and name the different market clearing mechanisms.
3. Write the names of different indices that are recognized by experts to measure the market concentration of industry.
4. Define Locational Marginal Prices (LMPs) and their significance.
5. Role of Independent System Operator (ISO).

PART - B

(Analytical/Problem solving questions)

Attempt any **four** questions **(4×10=40)**

1. Discuss different capacity alleviation methods with the help of suitable examples and diagrams.

2. What are the suitable measures you will take as a system operator to remove transmission congestion. Explain the basic principle of congestion management by defining basic building blocks and remedial technologies. Why congestion management is important in deregulated power system?

3. The demand curve for a product is to be estimated to given by the expression :

   $Q = 200 - \pi$

   Calculate the price and the price elasticity for following values of demand 0,50,100 and 200. Repeat these calculations when the expression is changed to $Q = 200/\pi$.

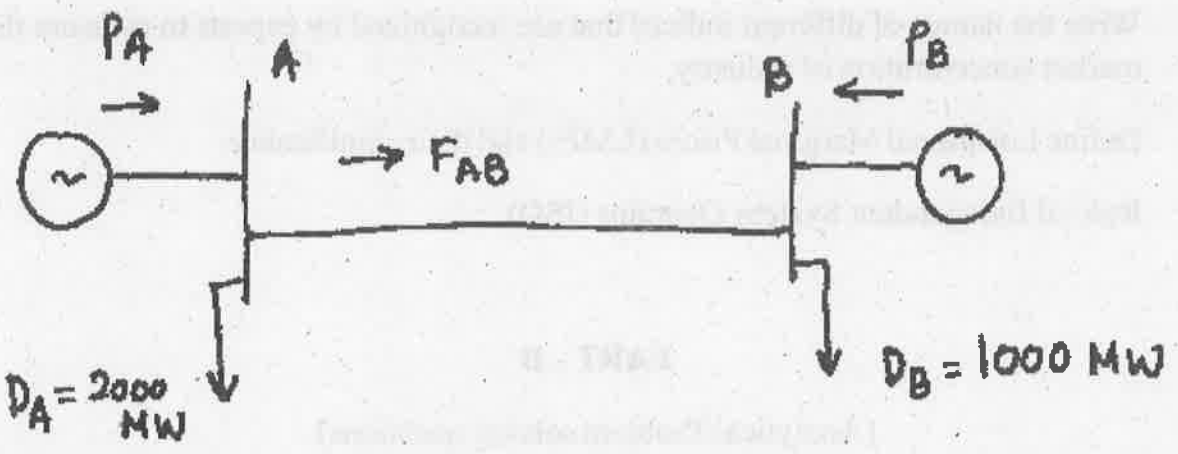
4. Derive the expressions for models of imperfect competition conditions of market. Explain Bertrand and Cournot models in detail.

5. Define and explain different services that are considered as Ancillary Services in a deregulated power system. Classify the services which fall under the direct control of ISO and which are obtained from outside the local control area.

6. Consider the two-bus power system shown in Figure. Assume that the demand is constant and insensitive to price and that energy is sold at its marginal cost of production and that there are no limits on the output of the generators. What is the maximum price that could be charged for transmission if the marginal costs of generation are as follows?

   $MC_a = 25\$/MWh$

   $MC_b = 17\$/MWh$



PART - C

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any **two** questions **(2×15=30)**

1. What is the basic principle of transmission line pricing. Give a clear classification of transmission pricing methods. Explain each of them with the help of suitable illustrated derivations and numerical analysis

2. Vertically integrated utilities often offer two-part tariffs to encourage their consumers to shift demand from on-peak load periods to off-peak periods. Consumption of electrical energy during on-peak and off-peak periods can be viewed as substitute products. The table below summarizes the results of experiments that the Company 1 and Company 2 has conducted with its two- part tariff. Use these results to estimate the elasticities and cross-elasticities of the demand for electrical energy during peak and off-peak periods.

   Table : Results of Experiments

	On Peak Price in Rs/MWh	Off peak price in Rs/MWh	Average on peak Demand in MWh	Average of Peak Demand MWh
Base case	8001	6000	1000	500
Experiment-1	8001	5000	992	509
Experiment-2	9010	6000	985	510

   Discuss the results and their significance.

3. Give a comparative analysis of different market models that include monopoly, single buyer, wholesale and retail. Give merits and demerits of these market models. Draw the block diagrams of all the models and explain the functioning blocks of each of these.