2013-14
B.TECH. (AUTUMN SEMESTER) EXAMINATION
ELECTRICAL ENGINEERING
POWER ELECTRONICS I
EE321N

Maximum Marks: 60  
Credits: 04  
Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.  

1(a) Draw the i-v characteristics of a thyristor and explain the following terms: [06]

i) Latching current

ii) Holding current

iii) Forward breakover voltage

Explain the effect of gate current on forward breakover voltage.

1(b) Draw the circuit symbol and i-v characteristics of a GTO. What are the advantages and disadvantages of GTO over an SCR? [06]

OR

1(b') Draw the structure, circuit symbol and i-v characteristics of a TRIAC. What are the different modes of triggering of TRIAC? Can the function of TRIAC be realised using thyristors? If yes explain how. [06]

2(a) With the help of neat sketch and relevant waveforms, explain the working of an RC triggering circuit for an SCR. What is the main advantage of this circuit over resistance triggering circuit? [06]

2(b) With the help of neat sketch explain the function of a driver circuit used to trigger an SCR. [06]

Contd……..
3. Draw the waveform of output voltage and source current of a two-pulse full-converter and show that the \(n\)th harmonic component of the source current is given by

\[
i_{n} = \frac{4I_{s}}{n\pi}\sin(n\omega t - n\alpha)
\]

Where \(I_{s}\) is the magnitude of the ripple-free output current.

OR

3'(a) Draw the circuit of a single-phase mid-point converter supplying a resistive load. Draw the waveforms of load voltage and anode to cathode voltages across the thyristors for \(\alpha = 90^\circ\). Find the expression of the output voltage.

3'(b) A two-pulse full converter is used to charge a battery. A resistance of 5\(\Omega\) is connected between battery and the converter to limit current. A large inductance is also connected to make the charging current continuous and ripple free. Find the load current and the output power for \(\alpha = 60^\circ\). The input voltage is given to be 50V. Draw the waveform of the source current.

4. Draw the circuit of a three-phase bridge-converter. If the converter is supplying a purely resistive load, draw the waveforms of the 3-phase input voltage, output voltage, voltage across any one thyristor and current through any one phase of the input source for \(\alpha = 60\) degrees. Clearly indicate the conduction interval of each device. Determine the average value of the output voltage if the line-to-line input voltage is given to be 400 volts.

5. With the help of neat sketch and relevant waveforms, explain the cosine firing scheme used for triggering SCRs of a single-phase full wave converter. Show that the output voltage of the converter is directly proportional to the control voltage of the firing circuit.

OR

5' What is a dual converter? Draw its circuit and explain its operation both with simultaneous and non-simultaneous control. Compare the two modes of operation.
<table>
<thead>
<tr>
<th>Q.No.</th>
<th>Question</th>
<th>M.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.1(a)</td>
<td>Discuss why it is necessary to heat the water (in a feed water heater) before feeding it to the boiler.</td>
<td>01</td>
</tr>
<tr>
<td>(b)</td>
<td>Draw the flue gas flow diagram of a thermal power plant.</td>
<td>01</td>
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<tr>
<td>(c)</td>
<td>Explain with the help of necessary diagram, the function of economizer in a TPP.</td>
<td>02</td>
</tr>
<tr>
<td>(d)</td>
<td>Why a moderator is necessary in a nuclear reactor? What materials are suitable as moderator materials in a reactor?</td>
<td>02</td>
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<tr>
<td>(e)</td>
<td>Explain with the help of schematic diagram, the construction and working of a fast breeder reactor.</td>
<td>06</td>
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</tbody>
</table>

**OR**

| (e')  | Find the U-235 fuel used in one year in a 235 MW pressurized water reactor. Assume an overall plant efficiency of 33% and 10% load factor throughout the year. | 06   |

| Q.2(a) | Classify different hydro power plants on the basis of load. Briefly explain each of them. | 02   |
| (b)   | Explain the working of pumped storage plant with the help of a suitable diagram. Also explain the purpose of surge tank in a hydro power plant? | 06   |

**OR**

| (b')  | Explain the construction and working of a Pelton turbine. | 06   |
(c) Explain with the help of necessary diagram, the working of a closed cycle gas turbine plants including regenerator, reheater and intercooler.

Q.3(a) What is distributed power generation? What are its advantages?
(b) Discuss the benefits and problems associated with the captive power plants.
(c) Discuss different types of captive power plants. Also name some industries using these types of captive power plants.

OR

(c') Explain with the help of suitable diagrams the difference between implant and reject heat cogeneration.

Q4(a) Find the height at which a light source having uniform spherical distribution should be placed over a floor in order that the intensity of horizontal illumination at a given distance from its vertical line may be greatest.
(b) Explain with a neat diagram the principle of operation of a sodium vapour lamp. Mention its uses.

OR

(b') Make a comparison between flat plate and tubular battery.

Q5(a) A 320-tonne electric train runs up an ascending gradient of 1.2% with the following speed time-curve:

i. Uniform acceleration of 2km/h/s for 20 seconds.
ii. Constant speed for 45 seconds.
iii. Coasting for 28 seconds and
iv. Braking at 2.82km/h/s to rest.

Calculate the specific energy consumption if train resistance is 45 N/t, effect of rotational inertia 8%, overall efficiency of
transmission gear and motor is 78%.

(b) Enumerate various types of railway track electrification systems used in practice. What are the advantages and disadvantages of composite system of traction employing 25KV A.C. supply and D.C. traction motors. How these drawbacks can be minimized.

OR

(b') Explain how an actual speed-time curve for an electric train service can be replaced by a curve having a simple geometric shape. Deduce from first principles the relation between acceleration, retardation, maximum speed, running time, and distance between stops, assuming a simplified speed-time curve.
Q1(a)i. Define and explain the following terms:
1. Glare
2. Contrast

ii. Prove that in a filament lamp the diameter of filament is directly proportional to $I^{2/3}$, where $I$ is the current flowing in the filament.

OR

(a') With the help of a suitable circuit diagram explain the working of a fluorescent tube. What is the function of choke and starter in the circuit?

(b) Estimate the number and wattage of lamps which would be required to illuminate a workshop of size 60mx15m by means of lamps mounted 5 meters above the working plane. The average illumination required is 100 lux; Coefficient of utilization=0.42; maintenance factor=0.8; luminous efficiency=16 lm/w; space-height ratio=unity

Q2(a) What are the advantages of electric heating? List the properties of good heating elements. Write a brief note about the materials used in heating elements.
(a') Explain the principle of induction heating and describe coreless type induction furnace.

(b) Define welding. Discuss the principle of operation and field of application of Laser welding.

Q3(a) Make a comparison between flat plate and tubular batteries.

OR

(a') What is electroplating and what for is it done? Describe in detail the process of nickel-electroplating in industry.

(b) Estimate the ampere-hours required to deposit a coating of silver 0.04mm thick on a sphere of 4.5 cm radius. E.C.E. of silver =111.8x10^-8 kg/c and relative density of silver=10.5

Q4(a) Explain speed-time curve of a train running on main line. Define crest speed, average speed and schedule speed.

OR

(a') What is tractive effort of a train and what are its functions? Derive an expression for tractive effort developed by a train unit.

(b) A 220-ton motor coach driven by four motors takes 18 seconds to attain a speed of 40km/h, starting from rest on an ascending gradient of 1 in 75. The gear ratio is 3.2, gear efficiency 90%, wheel diameter 92 cm, train resistance 45 N/t and rotational inertia 8% of dead weight. Find torque developed by each motor.

Q5(a) What are the different systems of track electrification, discuss them in brief.

OR

(a') Describe various types of current collectors in common use for overhead contact-wire system.

(b) State the main requirements for an ideal traction system. Name the different traction systems. Give merits and demerits of electric traction over steam engine traction.
2013-14
B.TECH. (AUTUMN SEMESTER) EXAMINATION
ELECTRICAL ENGINEERING
ELECTRICAL AND ELECTRONIC INSTRUMENTATION
EE-352N

Maximum Marks: 60 Credits: 04 Duration: Three Hours

Answer all the questions. Assume suitable data if missing. Notations used have their usual meaning.

Q.No. Question M.M.

1(a) Explain the working of a frequency measurement circuit utilizing Gate Control Flip Flops. [06]

1(b) What is over-ranging in Digital Voltmeters? [06]

A 4½ Digital Voltmeter is used for voltage measurements.

i) Find its resolution.

ii) How 12.98 V be displayed on a 100 V range?

iii) How would 0.8878 V be displayed on a 10 V range?

iv) How would 24.52 V be displayed on a 10 V range?

2(a) What is telemetry? Explain a type of position telemetry. [06]

2(b) Differentiate between the following terms [03]

i) Compinging and Amplification.

ii) Synchronous and Asynchronous Time Division Multiplexing.

2(c) Using waveforms show the generation of PPM. Also show the position of reference pulses. [03]

OR

2'(a) Obtain the expressions for the instantaneous amplitudes of Amplitude Modulated and Frequency Modulated signals and show the relevant waveforms. What is the significance of high frequency carrier wave? [07]

2'(b) Using suitable circuit diagram, explain the generation of PWM signal. [05]

Contd.......2
3 (a) In a Gyroscope, show that when input torque is applied along x-axis with initial spin axis along z-axis, the recession of the Gyroscope is along y-axis.

3 (b) Explain how power can be measured using Hall Effect Multipliers.

3 (c) Discuss about the frequency response of Capacitive Transducer. How its response can be improved for low frequencies?

OR

3'(a) Explain the working of a photomultiplier tube.

3'(b) Discuss the software compensation technique for the compensation of temperature variations of reference junction of thermocouples.

3'(c) Discuss the need of a three lead wire RTD (Resistance Thermometer) while measuring temperature using an RTD in bridge configuration.

4(a) Using appropriate diagrams, describe the working of an Ultrasonic Transducer. How thickness of the crystal is selected in Ultrasonic Transducers?

4(b) An inductive pickoff operating from a 120 tooth wheel is used with a Digital Frequency meter to measure the speed of rotation of the shaft on which the wheel is mounted. The gating period is set to $10^4 \mu s$ and reading of 0030 is obtained on a 4 digit display. What shaft speed does it represents in r.p.s.? If available gating periods are $10^2, 10^3, 10^4, 10^5, 10^6, 10^7 \mu s$ respectively, what would be the optimum setting of gating period to make this measurement?

OR

4'(a) What is a fibre optic sensor? Discuss the light modulation techniques used in an optical sensor in response to environmental changes?

4'(b) Explain the operation of an Electromagnetic Flow Meter.

5 (a) Describe the following components of Global Positioning System (GPS).
   
i) Space Segment
   ii) Control Segment
   iii) User Segment

What is the concept of Differential Global Positioning System (DGPS)?

5 (b) Explain how Smart Meters help in the economical operation of Electric Grid?
Answer all questions

1. (a) Explain the function of the following pins in 8085:
   (i) INTR  (ii) ALE  (iii) READY  (iv) RESET IN
   [4]

(b) Indicate the size and function of each of the registers given below.
   (i) Accumulator (ii) H-I. pair (iii) Stack Pointer (iv) PC
   [4]

(c) What is meant by multiplexed address and data bus?
   [2]

(d) Specify the contents of H and L after the execution of following instructions:
    (i) LXIH 2600 H   (ii) LHLD 2600 H
    The memory location 2600 H and 2601 H contains 30 H and 0A H respectively.
    [2]

OR

1’. (a) Explain the function of the following 8085 MPU instructions and write their addressing modes:
    (i) DAD B  (ii) XRA A  (iii) JMP (iv) RAR
    [4]

(b) What are tri state devices and why are they essential in a bus oriented system.
    [4]

(c) How many address lines are used in 8085 MPU to identify an I/O port in the peripheral I/O and in the memory mapped I/O methods?
    [4]

2. (a) What are the different interrupts of 8085 MPU and what is the difference between maskable and nonmaskable interrupts?
    [6]

(b) Assume the contents of accumulator are 0A H and register C are C8 H. After the execution of instruction ADD C, what will be the positions of conditional flags for 8085 MPU.
    [4]

(c) If the memory chip size is 256 x 1 bits, how many chips are required to make up 1K bytes of memory.
    [2]
3. (a) Draw and explain the timing diagram of OUT 50 H
(b) List the operating modes of 8255 A programmable peripheral interface.

OR

3' (a) Write control word for 8255 A to set up:
(i) Port A as an output port in Mode ‘0’
(ii) Port B as an output port in mode ‘1’.
(iii) Port C lower as an output port in mode ‘0’.
(b) Describe the main features of 8257 DMA controller.

4. (a) Explain the flag register of 8086 MUP, especially the function of T, I and D flags.
(b) Identify the addressing modes in the following instructions:
ADD AX, 0400 H
ADD AX, [0400 H]
ADD AX, [SI]
ADD [0400 H], 0100H
(c) Generate the physical address for 8086 MPU. Given the segment base as 12A4 H
and offset address as 0022 H.

5. (a) Describe various types of interrupts available in 8086.
(b) Discuss the significance of segment register in 8086 MPU.
2013-14
B.TECH. (AUTUMN SEMESTER) EXAMINATION
ECONOMICS AND MANAGEMENT
ME 340

Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.

1. a. Describe the differences between consumer and producer goods/services. Why is it more difficult to estimate the demand for producer goods? 03
   b. With the help of suitable examples explain the difference between monopoly and oligopoly. 03
   c. Eight years ago, a large capacity truck was purchased for Rs. 115,000 to provide short haul earthmoving services. The company sold it today for Rs. 45,000. Operating and maintenance cost averaged Rs. 10,500 per year. A complete overhaul at the end of year 4 cost an extra Rs. 3600. Calculate the present worth of the truck at 8% per year compounded quarterly. 06

   OR

1’. a. What are economic indicators? Name some and discuss any one of them in detail. 06
   b. For the cash flow shown, determine the present worth, if the interest rate is 12% per year 06
      
      | Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
      |-----|---|---|---|---|---|---|---|---|---|----|
      | Cash Flow(Rs.) | 130 | 130 | 130 | 130 | 160 | 190 | 220 | 250 | 280 | 310 |

2. a. Differentiate between
   i. Physical depreciation and functional depreciation
   ii. Book value and market value
   An asset that is depreciated over a 5 year period by straight line method has a book value of Rs. 62,000 in year 3 with a depreciation charge of Rs. 26,000 per year. Determine the first cost of the asset and the assumed salvage value. 06

   OR

   a. Two alternatives shown are under consideration for improving the security of an organisation. Determine which one should be selected on the basis of a B/C analysis, an interest rate of 7% and a 10 year study period. 06

Contd.……2
Extra Camera New Sensor

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<th></th>
<th>First Cost (Rs.)</th>
<th>Annual operation &amp; maintenance (Rs./year)</th>
<th>Benefits (Rs./year)</th>
<th>Disbenefits (Rs./year)</th>
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<td>38000</td>
<td>49000</td>
<td>110,000</td>
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<td></td>
<td>87000</td>
<td>64000</td>
<td>160,000</td>
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</table>

b. Compare the following two alternatives for an interest rate of 10% pa.

<table>
<thead>
<tr>
<th></th>
<th>Alternative 1</th>
<th>Alternative 2</th>
</tr>
</thead>
<tbody>
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<td>First cost (Rs.)</td>
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</tr>
<tr>
<td>Annual cost (Rs./year)</td>
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<td>2500</td>
</tr>
<tr>
<td>Salvage Value (Rs.)</td>
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<td>150,000</td>
</tr>
<tr>
<td>Life, years</td>
<td>3</td>
<td>.∞</td>
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</tbody>
</table>

3. a. Differentiate between top managers, middle managers and first line managers.

b. What are the advantages and limitations of group decision making? Differentiate between Delphi group decision making and nominal group decision making techniques.

c. Calculate the expected value for the alternatives given below:

<table>
<thead>
<tr>
<th>Probability</th>
<th>First Cost (Rs.)</th>
<th>Salvage Value (Rs.)</th>
<th>Annual Operating Cost (Rs.)</th>
<th>Life (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>20,000</td>
<td>2,000</td>
<td>11,000</td>
<td>5</td>
</tr>
<tr>
<td>0.5</td>
<td>25,000</td>
<td>4,000</td>
<td>9,000</td>
<td>5</td>
</tr>
<tr>
<td>0.3</td>
<td>28,000</td>
<td>5,000</td>
<td>5,000</td>
<td>5</td>
</tr>
</tbody>
</table>

Assume an interest rate of 10% compounded semiannually.

4. a. Define span of control. Differentiate between narrow and wide spans of control and discuss their implications.

b. Define strategic planning and discuss its basic foundation. Explain how strategic planning is related to operational planning.

OR

4' a. Define motivation and discuss the important implications of the "two factor theory" of motivation.

b. What is meant by the leadership continuum diagram? Discuss the important leadership styles on this continuum.

5 a. Differentiate between
   i. Balance sheet and income statement
   ii. Q/R inventory system and periodic inventory system

b. Discuss in detail the need and various methods used for forecasting human resource demand and supply.