2017-18
B.E. (AUTUMN SEMESTER) EXAMINATION
POWER ELECTRONICS-I
EEE-321N

Maximum Marks: 60
Credits: 04
Duration: Two Hours

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

1(a) Draw the dynamic switching characteristics of an SCR.

1(b) Draw the snubber circuit for the protection of an SCR. Explain the function of capacitor, resistor and diode in the snubber circuit.

1(c) Mention four features of an ideal switch. Draw the labelled I-V characteristics of an SCR.

2(a) A single phase full wave controlled converter is operated from 230V, 50 Hz ac supply. The load resistance is 10 ohm. If the average output voltage is 75% of the maximum possible average output voltage, determine

- Firing angle
- RMS and average output current

For the circuit shown in figure 1, draw the waveform for

2(b) i) input current
   ii) output voltage
   iii) voltage across T1

Assume the output current to be discontinuous.

2'(a) The fully controlled thyristor converter is fed from a single phase source. When the firing

*Contd...*
angle is 0°, the dc output voltage of the converter is 300V. What will be the output voltage for a firing angle of 60°, assume continuous conduction.

Find out the THD of the input line current for single phase full wave fully controlled rectifier feeding a highly inductive load. (07)

2'(b) Draw a full wave RC type firing circuit for an SCR and explain its working. (10)

3(a) Explain the function of a driver circuit. (02)

3(b) Derive the expression for the average output voltage of a three phase half wave converter feeding a resistive load for the following two cases.
   i. Firing angle is less than \(\pi/6\).
   ii. Firing angle is more than \(\pi/6\).

OR

4' Draw the waveforms for the output voltage and the input three phase current for the converter shown in figure 2. Assume firing angle to be \(\pi/6\). (12)

Figure 2

5(a) With the help of a circuit diagram and waveforms explain the working of an ac voltage regulator feeding an RL load. Also derive the expression for rms value of output voltage. (07)

5(b) With the help of a circuit diagram and waveforms explain the working of a single phase cyclo converter feeding a resistive load (05)
2017-18
B.E. (V SEMESTER) EXAMINATION
(ELECTRICAL)
ELECTRICAL POWER GENERATION AND UTILIZATION
(EEE-331)

Maximum Marks: 60
1. Attempt all questions.
2. Symbols and abbreviations used have their usual meaning.
3. Any missing data may suitably be assumed.
4. Wherever possible illustrate your answer with appropriate figures
5. Answer each question on a fresh page.

Duration: Two Hours

Q. No. Questions M.M.
1. Draw steam flow diagram of a thermal power plant and explain briefly each of its components. [12]

OR

1'. (a) With the help of a neat sketch, explain the working of boiling water reactor.
(b) Explain nuclear chain reaction. Also define the purpose and different properties of moderator materials.

2. (a) Explain briefly the working of pumped storage plant. [6]

OR

(a') Explain the following for a hydro power plant:
   a) Runoff
   b) Tail race
   c) Desilting tank
   d) Penstock [6]

(b) With the help of a relevant diagram, explain the working of a closed cycle gas turbine plant.

3. (a) What is cogeneration system? Explain its benefits. Also explain any one cogeneration technology with the help of suitable diagram.
(b) What are different types of captive power plant? Explain any two of them briefly. [6]

4. (a) What are the various supply systems used for railway electrification? Which one is being commonly adopted in our country? Explain.
(b) The speed-time curve of a train consists of:
   (i) Uniform acceleration of 6 km/h/s for 25 seconds;
   (ii) Free running for 10 minutes;
   (iii) Uniform retardation of 6 km/h/s to stop the train;
   (iv) Stop time of 5 minutes.
Find the distance between the stations, average speed and schedule speed.

Contd.....2.
5. (a) With the help of suitable diagram, explain the construction and working of high pressure mercury vapour lamp.

(b) If 18.258 gm of nickel are deposited by 100 A flowing for 10 minutes, how much copper would be deposited by 50 A for 6 minutes? Atomic weight of nickel = 58.6 and that of copper = 63.18. Valency of both is 2. Assume current efficiency = 100%.

OR

5'.(a) A drawing hall in an Engineering College is to be provided with a lighting installation. The hall is 30 m x 20 m x 8 m (high). The mounting height of the lamps is 5 m and the required level of illumination is 144 Lumens/m². Using metal filament lamp, estimate the size, number of single lamp luminaries and also draw their spacing layout. Assume utilization coefficient = 0.6; maintenance factor = 0.75; space/height ratio =1. Lumens/watt for 300 W lamp = 13, lumens/watt for 500 W lamp = 16.

(b) State and explain the inverse square law of illumination.
Maximum Marks: 60
Credits: 04
Duration: Two Hours

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

1(a) Explain measurement of a time interval between two events.
   a) Transducer for Pressure to displacement .............
   (04)
   b) Transducer for specific gravity to displacement .........
   (08)
   c) Transducer for Light intensity to voltage ............
   d) A number 301 is to be determined with successive approximation type DVM, the range is 0 – 511 (9 bit binary) its binary equivalent is ........
   e) A sample-and-hold circuit consists of (a) .............. (b) .............. (c) ..............
   f) The .............. is composed of a transformer with a movable core, a primary, and two secondaries.
   g) The purpose of compensation for a thermocouple is ..............
   h) In PCM encoding, quantization level varies as a function of ..............

2(a) Write a short note on signal conditioning system.

OR

2(a)' Explain with block diagram operation of sample & hold circuit.

2(b) The output of an LVDT is connected to a 5V voltmeter through an amplifier of amplification factor 250. The voltmeter scales has 100 divisions and the scale can be read to 1/5th of a division. An output of 2 mV appears across the terminals of the LVDT when the core is displaced through a distance of 0.5 mm. Calculate (a) the sensitivity of the LVDT, (b) that of the whole set up, and (c) the resolution of the instrument in mm

OR

2(b)' A capacitive transducer is made up of two concentric cylindrical electrodes. The outer diameter of the inner cylindrical electrode is 6 mm and the dielectric medium is air. The inner diameter of the outer electrode is 6.4 mm. Calculate the dielectric
stress when a voltage of 100V is applied across the electrodes. Is it within safe limits? The length of electrodes is 20mm. Calculate the change in capacitance if the inner electrode is moved through a distance of 2 mm. The breakdown strength of air is 2.5 kV/mm.

3(a). Explain dual slop integrating type digital voltmeter, draw the relationship between voltage and time for DVM. Also mention some advantages of the dual slop integrating type DVM over ramp and successive approximation type.

3(b). Derive the relationship between gauge factor and poisson ratio taking the strain into consideration. OR

3(b'). Explain ultrasonic flowmeter and derive the expression for flow rate, assume angle of incidence as $\alpha$.

4(a). Explain with block diagram digital Data Acquisition Systems.

OR

4(a'). Explain density and flow measurement with two transducers of each type.

4(b). 1) Four channels, two with a bit rate of 200 kbps and two with a bit rate 150 kbps are to be multiplexed using TMD with two synchronization bits. Frame has 3 bits from each from first two sources and 2 bits each from second two sources.
   a) What is the size of a frame in bits?
   b) What is the frame rate?
   c) What is the duration of a frame?
   d) What is the data rate?

2) The gap of a tape recorder is 6.25 $\mu$m. Determine the speed of the tape to have a satisfactory response at 50,000 Hz. Considering the recorded wavelength must be greater than 2.5 times the gap of the recorder.

5. Describe briefly about (ANY TWO) of the following
   a) MEMS fabrication.
   b) GPS system.
   c) Intelligent Instrumentation
   d) Wide Area Measurement.
Maximum Marks: 60  
Credits: 04  
Duration: Two Hour

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

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<tr>
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<tr>
<td>1.(a)</td>
<td>Enumerate various mechanisms that lead to breakdown in solid dielectrics and explain any two in brief.</td>
<td>[6]</td>
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<td>1.(b)</td>
<td>Explain the Townsend’s breakdown criterion in gases. In an experiment in a certain gas it was found that steady state current is $5.5 \times 10^{-6} \text{A}$ at 8kV at a distance of 0.4cm between the electrodes. Keeping the field constant and reducing the distance to 0.1cm results in a current $5.5 \times 10^{-9} \text{A}$. Calculate the Townsend’s primary ionization constant coefficient “a” neglecting secondary ionization effects.</td>
<td>[6]</td>
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<td>1’.(a)</td>
<td>What are commercial insulating liquids? Discuss the “Cavitation and Bubble Mechanism” as proposed to explain the breakdown in these liquids.</td>
<td>[6]</td>
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<td>1’.(b)</td>
<td>Define Paschen’s Law and explain the existence of minimum sparking potential in Paschen’s curve.</td>
<td>[6]</td>
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<td>2.(a)</td>
<td>Develop the expression for output voltage of a series RLC type impulse voltage generator and show that it is in the form of double exponential equation.</td>
<td>[6]</td>
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<td>2.(b)</td>
<td>Describe, with a neat sketch, the principle and working of Van de Graff Generator.</td>
<td>[6]</td>
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| 2’.(a) | A Cockcroft-Walton type voltage multiplier circuit has eight stages with capacitances, all equal to 0.05\mu F. The supply transformer secondary voltage is 125kV and frequency of 150Hz. If the load current to be supplied is 5mA, find:  
\[ a) \] the percentage ripple  
\[ b) \] the regulation  
\[ c) \] the optimum number of stages for minimum regulation or voltage drop. | [6] |
| 2’.(b) | Explain the working of Resonant Transformers for the generation of high a.c. voltages using appropriate circuit diagram. | [6] |

3.(a) With the help of suitable circuit diagram, explain the measurement of peak a.c. voltages by Chubb-Fortescue method. Enumerate sources of errors in the method. | [6] |

contd... 2.
3.(b) Explain the working of capacitive voltage divider for measurement of high a.c. voltages. Why are these preferred over resistive voltage divider?

OR

3.(b') Describe in brief the principle for measurement of high voltages using Sphere Gap method and discuss factors influencing spark over voltages.

4.(a) Define apparent charge and determine its expression for discharge occurring in voids using an analogue circuit.

4.(b) Draw different circuits for the measurement of d.c. resistivity of a dielectric specimen and explain the working of any one of them.

5.(a) In context to high voltage testing of electrical apparatus, define the following:
   a) Disruptive Discharge Voltage
   b) Withstand Voltage
   c) 50% Flashover Voltage
   d) Reference Atmospheric Conditions

5.(b) Describe Impulse Withstand Test and Visible Discharge Test performed on bushings of high voltage equipments.
Q. No.  

1(a) What do you understand by the economic indicators of the nation's economy? Briefly explain any two.

1(b) Alternative-1: Initial purchase cost = Rs.300000, Annual operating and maintenance cost = Rs.20000 for first year and increase Rs.1000 thereafter, Expected salvage value = Rs.125000, Useful life = 5 years.
   Alternative-2: Initial purchase cost = Rs.200000, Annual operating and maintenance cost = Rs.35000 for first year and increase Rs.1200 thereafter, Expected salvage value = Rs.70000, Useful life = 5 years.
   The annual revenue to be generated from production of concrete (by concrete mixer) from Alternative-1 and Alternative-2 are Rs.50000 and Rs.45000 respectively. Compute the equivalent present worth of the alternatives, if the rate of interest is 10% per year and suggest the economical alternative.

OR

1'(a) What do you mean by Necessities and Luxuries?

1'(b) There are two alternatives for a construction firm to purchase a road roller. The details of the alternatives are as follows;
   Alternative-1: Initial purchase cost = Rs.1500000, Annual operating cost = Rs.35000 starting from the end of year '2' (negligible in the first year) till the end of useful life, Annual revenue to be generated = Rs.340000 for first 4 years and then Rs.320000 afterwards till the end of useful life, Expected salvage value = Rs.430000, Useful life = 8 years.
   Alternative-2: Initial purchase cost = Rs.1800000, Annual operating cost = Rs.25000, Annual revenue to be generated = Rs.365000, Expected salvage value = Rs.550000, Useful life = 8 years.
   Find out the most economical alternative on the basis of equivalent future worth at the interest rate of 9.5% per year.

2(a) A machine was purchased two years ago for Rs. 10,000. Its annual maintenance cost is Rs. 750. Its life is six years and its salvage value at the end of its life is Rs. 1,000. Now,
a company is offering a new machine at a cost of Rs. 10,000. Its life is four years and its salvage value at the end of its life is Rs. 4,000. The annual maintenance cost of the new machine is Rs. 500. The company which is supplying the new machine is willing to take the old machine for Rs. 8,000 if it is replaced by the new machine. Assume an interest rate of 12%, compounded annually. Decide whether it’s advisable to replace the old machine or not?

2(b) List the various criteria for performing a cost-benefit analysis?

Two mutually exclusive projects are being considered for investment. Project A1 requires an initial outlay of Rs. 30,00,000 with net receipts estimated as Rs. 9,00,000 per year for the next 5 years. The initial outlay for the project A2 is Rs. 60,00,000, and net receipts have been estimated at Rs. 15,00,000 per year for the next seven years. There is no salvage value associated with either of the projects. Using the benefit cost ratio, which project would you select? Assume an interest rate of 10%.

OR

2(a') Explain briefly declining balance method of depreciation.

A company has purchased an equipment whose first cost is Rs. 1,00,000 with an estimated life of eight years. The estimated salvage value of the equipment at the end of its lifetime is Rs. 20,000.

i. Determine the depreciation rate at the end of 5th year and book value at the end of 6th year, using the straight line method.

ii. Compare the results by declining balance method by taking d = 0.2.

2(b') What do you understand by Inflation? Explain briefly and list its causes.

3(a) Define Management. Explain the major functions of management.

3(b) Explain the various decision making techniques. Derive the expression for break even quantity.

4(a) Discuss four principles of organizing by giving suitable examples.

4(b) Briefly explain planning in any organization? Explain different kind of organisational plans with examples.

OR

4'(a) Define leadership. Briefly discuss the leadership styles.

4'(b) List the theories of Motivation. Explain Maslow’s theory of hierarchy of needs.

5 (a) What are different functions of operation management? Explain how operations management will be performed with reference to automobile industry.

5 (b) Describe the processes of human resource planning, recruiting, and selection.

5 (c) Explain the scope of marketing with the pretext of what is being marketed.