2017-18
B.E. (WINTER SEMESTER) EXAMINATION
ELECTRICAL ENGINEERING
POWER ELECTRONICS – II
EEE-322N

Maximum Marks: 60 Credits: 04 Duration: Two Hours

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

Q.No. Question M.M.
1(a) Draw the circuit symbol, transfer characteristics, output characteristic and switching characteristics of power MOSFET. [06]

OR

1(a') Draw the circuit symbol, transfer characteristics, static I-V characteristics and switching characteristics of IGBT. [06]

1(b) Explain the gate drive circuit for power MOSFET. [06]

2(a) Explain different modes of operation of a buck-boost converter with the help of suitable circuit diagram and waveforms. [06]

OR

2(a') Explain different modes of operation of a cuk converter with the help of suitable circuit diagram and waveforms. [06]

2(b) Why switching power supply is used? Explain the working of switching power supply with the help of schematic diagram. [06]

3(a) Explain the principle of integral cycle control for regulating the power flow in single phase ac voltage controller with resistive load. Determine the rms value of output voltage, average value of thyristor current and rms value of thyristor current. [06]

OR

3(a') Explain the working of single phase voltage controller which is controlled by phase angle control and feeding a RL load. [06]

3(b) Draw the voltage and current waveform of single phase voltage controller which is controlled by phase angle control and feeding a resistive load. Also determine the harmonics of output voltage and input current. [06]

4. Why single phase parallel inverter is called the parallel inverter? Explain different modes of parallel inverter with the help of circuit diagrams and waveforms. [12]
5(a) Explain the 180° conduction mode of three phase bridge inverter with the help of neat and clean waveforms. Draw the gating signals to the switches being used.

OR

5(a') Explain the 120° conduction mode of three phase bridge inverter with the help of neat and clean waveforms. Draw the gating signals to the switches being used.

5(b) Explain briefly different PWM techniques with the help of waveforms.
Maximum Marks: 60  
Credits: 04  
Duration: Two Hours

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

Q.No.  
1(a) Classify resources of energy. Discuss both energy resources those are classified based on commercial application.  
[06]

1(b) Give classification of various methods of energy storage. With the help of neat sketch explain pumped storage method of storing energy.  
[06]

OR

1(b') What are various aspects of energy conservation? Discuss any one of them.  
[06]

2(a) A PV source having $I-V$ characteristic as shown in the figure given below, is supplying power to a load whose load line intersects characteristic at (12V, 10A). Determine the additional power gained if an MPPT is interposed between the source and the load. If the cost of the MPPT is Rs. 5000.00, for how long does the system need to operate in order to recover the cost of MPPT? The cost of electricity may be assumed as Rs 6.00 per kWh. Consider efficiency of MPPT to be 96%.

2(b) With the help of suitable diagram describe phenomenon of extraterrestrial and terrestrial radiations. What do you understand by solar constant? What is the standard value of solar constant?  
[06]

OR

contd...
2′(b) Give a neat diagram of central tower receiver power plant and explain its operation. [06]

3(a) Enumerate different conversion technologies for extracting energy from biomass. Discuss thermochemical method for extracting biomass energy. [06]

3(b) Classify bio-gas plant. With neat sketch, explain Batch type Bio-Gas Plant. [06]

OR

3(b′) With neat sketch, explain constant volume type bio-gas plant. [06]

4(a) A propeller type wind turbine has the following data:
Speed of wind = 20 m/s upstream, Air density = 1.226 kg/m³
wind velocity at turbine reduced by 15%, generator efficiency = 80%
find:
i. Total power available in wind
ii. Power coefficient
iii. Power extracted by turbine
iv. Electrical power generated [06]

4(b) Sketch the diagram of a Horizontal Axis Wind Turbine (HAWT). Explain the functions of anemometer and nacelle. [06]

OR

4(b′) With the help of block diagram, explain functions of various blocks of a Wind Energy Conversion System (WECS). [06]

5(a) Give classification of fuel cell. What are the advantages and disadvantages of fuel cell? [06]

5(b) Name various types of geothermal resources. With neat sketch explain Liquid Dominated – Low Temperature Geothermal System. [06]

OR

5(b′) With the help of neat sketch explain Single Basin Single Effect Scheme of tidal energy conversion scheme. [06]
2017-18  
B.E. (WINTER SEMESTER) EXAMINATION  
BRANCH: ELECTRICAL  
POWER SYSTEM PROTECTION  
COURSE CODE: EEE-333N  

Maximum Marks: 60  
Credits: 04  
Duration: Two Hours  

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

<table>
<thead>
<tr>
<th>Q.No.</th>
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<th>M.M. 60</th>
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<tbody>
<tr>
<td>1. (a)</td>
<td>What do you understand by zones of protection, illustrate various protective zones of a typical power system.</td>
<td>[6]</td>
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<tr>
<td>1. (b)</td>
<td>With the help of neat diagram, explain the principle of operation of directional overcurrent relay.</td>
<td>[6]</td>
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<td><strong>OR</strong></td>
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<tr>
<td>1. (b')</td>
<td>Define distance relay. Describe in brief the construction and operation of impedance relay.</td>
<td>[6]</td>
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<tr>
<td>2. (a)</td>
<td>Describe in detail the Merz Price Differential Protection Scheme applied for protection of stator windings of alternator.</td>
<td>[6]</td>
</tr>
<tr>
<td>2. (b)</td>
<td>Explain the construction and operation of Buchholz Relay with a neat labelled diagram.</td>
<td>[6]</td>
</tr>
<tr>
<td>3. (a)</td>
<td>What do you understand by current chopping? Discuss the problems associated with the interruption of low inductive current.</td>
<td>[6]</td>
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<td><strong>OR</strong></td>
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<tr>
<td>3. (a')</td>
<td>Describe in brief different methods of interrupting arc current in circuit breakers.</td>
<td>[6]</td>
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</table>

| 3. (b) | In a 132 kV, 50 Hz system, the reactance and capacitance per phase up to the location of the circuit breaker is 3.14 kΩ and 0.02 µF. If the circuit breaker interrupts a magnetizing current of 20 A (instantaneous), current chopping occurs. Determine the voltage which will appear across the contacts of the circuit breaker. Also calculate the value of resistance which should be connected across the contacts to eliminate the transient re-striking voltage. | [6]     |
| 4. (a) | Discuss the principle of self-generated pressure oil circuit breaker and describe the construction of any one type of explosion pot. | [6]     |
| 4. (b) | Define and explain the terms (a) symmetrical breaking current, (b) asymmetrical breaking current and (c) making current as applied to circuit breakers. | [6]     |

*Contd... 2.*
5(a) An overhead line of surge impedance 400 \( \Omega \) is connected in series with a cable of surge impedance 40 ohms. The cable is 5 km in length and is short circuited at its far end. A surge of peak value 100 kV travels along the overhead line towards the junction of the line and the cable. Find the voltage distribution at the instants 1 and 50 microseconds after the surge reaches the junction. The velocities of propagation in the overhead line and the cable are \( 3 \times 10^5 \) km/s and \( 1.4 \times 10^5 \) km/s respectively.

5(b) What is the necessity of protecting electrical equipment against travelling waves? Describe in brief the construction and operation of a Non-Linear Surge Diverter.

OR

5(b') With the help of suitable diagrams, discuss the use of ground wires for protection of the overhead lines against direct lightning strokes.
(b) Three 20 MVA generators each with 0.15 per unit reactance are connected through three reactors to a common busbar. Each feeder connected to the generator side of a reactor has 200 MVA circuit breaker. Determine the minimum value of reactor reactance if the busbar voltage is 11 KV.

OR

3'. (a) Prove that symmetrical component transformation is power invariant.
(b) The per unit values of positive, negative and zero sequence reactance of a network at fault are 0.16, 0.14 and 0.1 respectively. Determine the fault current if the fault is double line to ground.

4. (a) Derive the Swing Equation to represent dynamics of synchronous machines. Discuss various methods for the improvement of transient stability of power system.
(b) Discuss equal area criteria for transient stability when one of parallel lines is suddenly switched off.

OR

4'. (a) What do you understand by the terms “Voltages stability and voltage Collapse”? How can the voltage stability of a power system improved?
(b) A loss free generator supplies 50 MW to an infinite bus, the steady state limit of the system being 100 MW. Determine whether the generator will remain in synchronism if the prime-mover input is suddenly increased by 30 MW.

5. (a) With reference to a distribution system, explain Ring main System. Also mention its advantages.
(b) A 2-wire d.c. distributor ABCDEA in the form of a ring main is fed at point A at 220 V and loaded as under:
10 A at B; 20 A at C; 30 A at D and 10 A at E.
The resistance of various sections (go and return) are: AB = 0.1 Ω; BC = 0.95 Ω; CD = 0.01 Ω; DE = 0.025 Ω and EA = 0.075 Ω. Find the point of minimum potential and current flowing in each section of distributor.
2017-18  
B.E. (VI SEMESTER) EXAMINATION  
(ELECTRICAL ENGINEERING)  
POWER SYSTEM ANALYSIS  
(EEE-335N)  

Maximum Marks: 60  
Duration: Two Hours

Attempt all questions.  
Any data, if missing, may suitably be assumed.  
Symbols and Notations used carry their usual meanings.  
Start writing each answer from a fresh page.

<table>
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<tr>
<td>1. (a)</td>
<td>What is the purpose of performing load flow analysis in power system? Derive static load flow equation (SLFE) using $Y_{Bus}$ as network model.</td>
<td>[6]</td>
</tr>
<tr>
<td>(b)</td>
<td>How are buses classified in load flow analysis? Justify their classification. Enumerate the advantages and disadvantages of $Y_{Bus}$ over $Z_{Bus}$ as network model.</td>
<td>[6]</td>
</tr>
<tr>
<td>1'. (a)</td>
<td>A 3-bus system is shown in fig.-1 wherein line admittances in per unit are indicated on the diagram and shunt admittances at buses are neglected. Form $Y_{Bus}$ using singular transformation.</td>
<td>[6]</td>
</tr>
<tr>
<td>(b)</td>
<td>Compare Gauss-Siedal and Newton Raphson methods of load flow analysis.</td>
<td>[6]</td>
</tr>
</tbody>
</table>
| 2. (a) | A constant load of 300 MW is supplied by two 200 MW generators 1 and 2 for which the respective incremental fuel costs are:  
\[
\frac{dc_1}{dp_1} = 0.10 P_1 + 20.0 \quad ; \quad \frac{dc_2}{dp_2} = 0.12 P_2 + 15.0
\]  
with powers $P_1$ and $P_2$ in MW and Costs in Rs/hr. Determine:  
(a) the most economical division of load between the generators,  
(b) the saving in Rs/Day thereby obtained compared to equal load sharing between machines. | [6] |
| (b) | Derive the 'coordination equation' for economic allocation of power between various plants of a system including the effect of transmission loss. | [6] |
| 3. (a) | Derive an expression of fault current when double line fault occurs at a given point in a power system taking into account the pre-fault load current. Draw the sequence network connection diagram. | [6] |

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2017 – 2018
WINTER SEMESTER EXAMINATION
(B.E ELECTRICAL)
DYNAMIC SYSTEM ANALYSIS
(EEE-341H)

Maximum Marks: 60 Credits: 04 Duration: TWO HOURS

Attempt all questions
Assume suitable data if missing
Notations used have their usual meaning

Q.No Questions Marks
1(a) With the help of neat diagram, obtain the transfer function and block diagram of an armature-controlled DC motor. [12]
2(a) Obtain the transfer function C/R of the block diagram shown in figure-1 using Mason’s Gain Formula. [06]

![Figure-1]

2(b) Differentiate between AC servomotors and DC servomotors. [06]

OR

2' Obtain the overall transfer function for the block diagram shown in figure-2 using block diagram reduction technique. [12]

![Figure-2]

contd... 2
3(a) A system oscillates with frequency $\omega$, if it has poles at $s = \pm j\omega$ and no poles in the right half $s$-plane. Determine the values of $K$ and $a$ so that the system shown in figure-3 oscillates at a frequency 2 rad/sec.

![Figure-3](image)

3(b) Consider the system shown in figure-4. Determine the value of $K$ such that the damping ratio $\zeta$ is 0.5. Then obtain the rise time ($t_r$), peak time ($t_p$), maximum overshoot ($M_p$), and settling time ($t_s$) in the unit step response.

![Figure-4](image)

OR

3' The open loop transfer function of a control system is given by

$$G(s)H(s) = \frac{K}{s(s+6)(s^2+4s+13)}$$

Sketch the root locus and determine the stability condition.

4(a) Determine the frequency domain specifications for a second order system with unity feedback, given its open loop transfer function as $-\frac{225}{s(s+6)}$.

4(b) Sketch polar plot of $G(s) = \frac{20}{s(s+1)(s+2)}$.

OR

4' Draw the bode plot of $G(s) = \frac{16(1 + 0.5s)}{s^2(1 + 0.125s)(1 + 0.1s)}$.

5(a) What are compensators? Draw the electrical networks used for phase-lead and phase-lag compensation.

5(b) Show that the derivative controller improves the transient response of a control system.