Total No. of Questions: 22

Enrollment No : _____

MEDICAPS UNIVERSITY

Faculty of Engineering

End Semester Examination May 2025

EE3CO62 Power System -I

Programme	:	B.Tech.	**Branch/Specialisation**	:	EE
Duration	:	3 hours	**Maximum Marks**	:	60

Note: *All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary. Notations and symbols have their usual meaning.*

Section 1 (Answer all question(s))

Marks CO BL

Q1. The ratio of average load to the maximum demand during a given period is known as- **1 1 1**

- (•) Load factor
- ( ) Diversity factor
- ( ) Plant capacity factor
- ( ) None of these

Q2. Which of the following is a component of hydroelectric power station? **1 1 1**

- ( ) Boiler
- ( ) Economiser
- ( ) Condenser
- (•) Penstock

Q3. Which of the following insulator is also known as disc insulator? **1 1 1**

- ( ) Pin insulator
- ( ) Shackle insulator
- (•) Suspension insulator
- ( ) None of these

Q4. What is the effect of ice loading on sag? **1 2 2**

- ( ) Sag decreases
- (•) Sag increases
- ( ) No change in sag
- ( ) None of these

Q5. Performance of short transmission lines depends on which of the following? **1 1 1**

- ( ) Resistance and capacitance
- (•) Resistance and Inductance
- ( ) Inductance and capacitance
- ( ) Resistance, inductance and capacitance

Q6. What is the main effect of increasing the length of a transmission line? **1 1 2**

- ( ) Decreased voltage drop
- ( ) Increased power factor
- (•) Increased voltage drop
- ( ) No change in performance

Q7. Which among these is the most commonly occurring fault? **1 2 2**

- (•) Single line to ground fault
- ( ) Double line to ground fault
- ( ) Line to line fault
- ( ) Fault due to all the three phases to earth

Q8. The value of expression $1+ \alpha+ \alpha^2$ - **1 2 2**

- (•) 0
- ( ) 1
- ( ) -1
- ( ) 2

Q9. What happens when a circuit breaker trips? **1 1 2**

- ( ) The current continues to flow
- (•) The circuit is opened to prevent damage
- ( ) The voltage increases
- ( ) It stores excess power

Q10. What is used to extinguish the arc in an oil circuit breaker? **1 2 2**

- ( ) Water
- (•) Oil
- ( ) Air
- ( ) Vacuum

Section 2 (Answer all question(s))

Marks CO BL

Q11. Define the following terms: **3 2 1**
(i) Load factor
(ii) Maximum demand
(iii) Demand factor

Rubric	Marks
Define load factor	1
Define maximum demand	1
Define demand factor	1

Q12. (a) Draw and explain the schematic diagram of a steam power station in detail. Also write the conditions for site selection of steam power station. **7 2 2**

Rubric	Marks
Draw the schematic diagram of a steam power station	2
Explain the schematic diagram of a steam power station	3
Conditions for site selection of steam power station	2

(OR)

(b) Draw and explain the schematic diagram of a hydroelectric power station in detail. Also write the conditions for site selection of hydroelectric power station.

Rubric	Marks
Draw the schematic diagram of a hydroelectric power station	2
Explain the schematic diagram of a hydroelectric power station	3
Conditions for site selection of hydroelectric power station	2

Section 3 (Answer all question(s))

Marks CO BL

Q13. Define string efficiency. Also write down the methods for improving string efficiency. **4 2 2**

Rubric	Marks
Define string efficiency.	2
Methods for improving string efficiency	2

Q14. (a) In a 33 kV overhead line, there are three units in the string of insulators. If the capacitance between each insulator pin and earth is 11% of self-capacitance of each insulator, find
(i) The distribution of voltage over 3 insulators and
(ii) String efficiency.

6 4 3

Rubric	Marks
Distribution of voltage over 3 insulators	5
String efficiency	1

(OR)

(b) A 3-phase transmission line is being supported by three disc insulators. The potentials across top unit (i.e., near to the tower) and middle unit are 8 kV and 11 kV respectively. Calculate
(i) The ratio of capacitance between pin and earth to the self-capacitance of each unit
(ii) The line voltage and
(iii) String efficiency.

Rubric	Marks
The ratio of capacitance between pin and earth to the self-capacitance of each unit	2
The line voltage	3
String efficiency	1

Section 4 (Answer all question(s))

Marks CO BL

Q15. Explain the nominal T method for the solution of medium transmission lines with suitable circuit and phasor diagram.

4 3 3

Rubric	Marks
Circuit and phasor diagram	3
Explanation	1

Q16. (a) A 3-phase, 50-Hz overhead transmission line 100 km long has the following constants: **6 4 3**
Resistance/km/phase = 0.1 Ω
Inductive reactance/km/phase = 0·2 Ω
Capacitive susceptance/km/phase = $0{\cdot}04\times10^{-4}$ siemens, when supplying a balanced load of 10,000 kW at 66 kV, p.f. 0·8 lagging. Determine
(i) the sending end current (ii) sending end voltage and (iii) sending end power factor.
Use nominal T method.

Rubric	Marks
Sending end current	2.5
Sending end voltage	2.5
Sending end power factor	1

(OR)

(b) A 3-phase, 50Hz, 150 km line has a resistance, inductive reactance and capacitive shunt admittance of 0·1 Ω, 0·5 Ω and 3×10^{-6} S per km per phase. If the line delivers 50 MW at 110 kV and 0·8 p.f. lagging, determine the sending end voltage and current. Assume a nominal π circuit for the line.

Rubric	Marks
Sending end voltage	3
Sending end current	3

Section 5 (Answer all question(s))

Marks CO BL

Q17. Differentiate between symmetrical and unsymmetrical faults. **2 4 4**

Rubric	Marks
Differentiate between symmetrical and unsymmetrical faults.	2

Q18. Explain about symmetrical components in terms of phase current with the help of suitable diagram. **3 3 3**

Rubric	Marks
Explanation	2
Diagram	1

Q19. (a) A 3-phase, 20 MVA, 10 kV alternator has internal reactance of 5% and negligible resistance. Find the external reactance per phase to be connected in series with the alternator so that steady current on short-circuit does not exceed 8 times the full load current. **5 4 3**

Rubric	Marks
Full load current	1
Voltage per phase	1
Per phase external reactance required	3

(OR)

(b) The sequence voltages in the red phase are as under: $E_{R0} = 100$ V ; $E_{R1} = (200 - j\ 100)$ V ; $E_{R2} = -100$ V. Find the phase voltages E_R, E_Y and E_B.

Rubric	Marks
E_R	1
E_Y	2
E_B	2

Section 6 (Answer any 2 question(s))

Marks CO BL

Q20. Write short note on Oil circuit breaker. **5 3 2**

Rubric	Marks
Explanation	3
Diagram	2

Q21. Write short note on Air blast circuit breaker. **5 3 2**

Rubric	Marks
Explanation	3
Diagram	2

Q22. Write short note on SF6 circuit breaker. **5 3 2**

Rubric	Marks
Explanation	3
Diagram	2

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