Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth semester B.Tech degree examinations (S), September 2020

Course Code: EE306

Course Name: POWER SYSTEM ANALYSIS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

		Marks
1	Define per unit representation of electrical quantities? List out its advantages.	(5)
2	Explain short circuit MVA and its significance in analysing faults in power system.	(5)
3	Classify the various types of buses in a power system for load flow studies.	(5)
4	Explain the basic generator control loops.	(5)
5	Two units have following cost function $F_1= 120+22P_1+0.05P_1^2$ Rs/hr $F_2= 120+16P_2+0.06P_2^2$ Rs/hr where P_1 and P_2 in MW. The generator limits are $20 \leq P_1 \leq 100$ MW $20 \leq P_2 \leq 100$ MW Find the economic dispatch for a total demand of 180 MW.	(5)
6	Explain unit commitment? List out the constraints on unit commitment.	(5)
7	Explain the three different stabilities of a power system.	(5)
8	Explain critical clearing angle and its significance with respect to the stability of a power system.	(5)

PART B

Answer any two full questions, each carries 10 marks.

9	A 30 MVA, 13.8 KV, 3-phase generator has a sub transient reactance of 15%. The generator supplies 2 motors through a step-up transformer - transmission line – step-down transformer arrangement. The motors have rated inputs of 20 MVA and 10 MVA at 12.8 KV with 20% sub transient reactance each. The 3-phase transformers are rated at 35 MVA, 13.2 KV -Δ/115 KV-Y with 10 % leakage reactance. The line reactance is 80 ohms. Draw the equivalent per unit reactance diagram by selecting the generator ratings as base values in the generator circuit.	(10)

10 a) Explain the significance of symmetrical components in power system. (4)

b) Derive the expression for symmetrical components of voltages in terms of phase voltages and hence obtain transformation matrix. (6)

11 Derive the expression for fault current and draw the interconnection of sequence networks for line to line fault on the terminals of an unloaded generator. (10)

PART C

Answer any two full questions, each carries 10 marks.

12 Derive the static load flow equations for a power system. (10)

13 a) Write down the steps involved in solving load flow equation using Guass Siedel method when voltage controlled buses are absent. (7)

b) Enumerate the objectives of AGC. (3)

14 Develop and explain the block diagram of automatic load frequency control of an isolated power system. (10)

PART D

Answer any two full questions, each carries 10 marks.

15 a) Derive the expression for economic operation of a plant having different units neglecting transmission losses. (5)

b) A 2 bus system consist of two power plants connected by a transmission line. The cost curve characteristics of the two plants are (5)

$C_1 = 0.01P_1^2 + 18P_1 + 20$ Rs/hr

$C_2 = 0.03P_2^2 + 33P_2 + 40$ Rs/hr

When a power of 120 MW is transmitted from plant 1 to load (near to plant 2), a loss of 16.425 MW is occurred. Determine the optimal scheduling of plants and load demand, if cost of received power is 36 Rs./MWhr .

16 a) Explain the steady state limit of a power system with the help of power angle diagram. (3)

b) Explain the equal area criterion for assessing the stability of a power system. (4)

c) List the methods for improving transient stability of a power system. (3)

17 a) Derive the equation for penalty factor for optimal system operation. (5)

b) Derive the swing equation representing the rotor dynamics of a synchronous machine. (5)

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