GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2020-2021
ADVANCE POWER SYSTEMS
EE703A

TIME ALLOTTED: 3 HOURS **FULL MARKS: 70**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)

Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

		Marks	CO No
(i)	Lightning arrester should be located a) near the circuit breaker b) away from the circuit breaker c) near the transformer d) away from the transformer.	1	CO4
(ii)	Load compensation is used to improve a) voltage profile and power factor b) voltage profile and reactive power c) reactive power and power factor d) none of these.	1	CO4
(iii)	TCSC is a) shunt controller b) series controller c) both (a) and (b) d) none of these.	1	CO2
(iv)	Series compensation in transmission lines a) increases stability limit b) decreases stability limit c) has no effect on stability limit d) none of these.	1	CO4
(v)	The propagation constant is given by a) $\gamma = \sqrt{(Z/Y)}$ b) $\gamma=\sqrt{(ZY)}$ c) $\gamma=\sqrt{(Z+Y)}$ d) $\gamma=\sqrt{(Z-Y)}$	1	CO4
(vi)	An uncompensated transmission line on open circuit leads to a) Ferranti effect b) line charging current flowing into generators is more c) both (a) & (b) d) none of these	1	CO4
(vii)	If penalty factor of a plant is unity. Its incremental transmission loss is a) -1 b) 0.0	1	CO2

c) 1
d) 2.0

(viii) The generating station suitable to operate as peak load plant is — 1 — CO1
a) thermal power station
b) nuclear power station
c) pumped storage power station
d) none of these .

(ix) Unit of regulation of speed governor is — 1 — CO3
a) Hz/MW
b) MW/Hz
c) Unit less
d) km/sec.

(x) If a generating units is situated very near to the load center the penalty factor for this unit will be — 1 — CO1
a) about 1
b) zero
c) infinity
d) none of these

(xi) The unit of transmission loss coefficient is — 1 — CO2
a) MW
b) $(MW)^{-1}$
c) $(MW)^{-2}$
d) Unit less.

(xii) In central AGC of a given control area, the change in (error) frequency — 1 — CO3
a) area control error
b) volume control error
c) nonlinear Control error
d) optimal control error.

GROUP – B
(Short Answer Type Questions)

Answer any ***three*** from the following: **3×5=15**

		Marks	CO No
2.	A generating unit has 200 MW units whose input cost data is as under: $F_1=0.004P_1^2 +2.0\ P_1 +80$ Rs/hr $F_2=0.006\ P_2^2+1.5\ P_2 +100$ Rs/hr. For a total load of 250 MW find the load division between the two units for economic operation.	5	CO2
3.	A 100 MVA synchronous generator operates on full load at a frequency of 50 HZ .The load is suddenly reduced to 50 MW. Due to time lag in governor system, the steam valve begins to close after 0.4s.Determine the change in frequency that occurs in this time. Take H=5 KWs/KVA of generator capacity.	5	CO3
4.	What is importance of restructure and deregulation environment in power system	5	CO1

5.		Develop the condition of economic operation of a power system with transmission line loss not being considered.	5	CO2
6.		What do you mean by ALFC? Derive the block diagram of primary ALFC loop.	5	CO1

GROUP – C
(Long Answer Type Questions)

Answer any ***three*** from the following: **3×15=45**

			Marks	CO No
7.	(a)	What is the definition of FACTS as per IEEE?	3	CO4
	(b)	Give the classification diagram of FACTS controllers. Draw the symbols of all FACTS controllers	6	CO4
	(c)	Draw the VI characteristics of TCR. From the diagram show that under what condition TCR becomes a TSR?	6	CO4
8.	(a)	Derive the expression for reflection and refraction coefficients for voltage and current travelling waves.	7	CO3
	(b)	A 220 kV surge travels on a line of 400 Ω surge impedance and reaches a junction where two branch lines of surge impedances 550 Ω and 350 Ω, respectively are connected with the transmission line. Find the surge voltage and current transmitted into each branch line. Also find the reflected voltage and current.	8	CO3
9.	(a)	Draw and level the complete block diagram representation of a two-area control system.	7	CO4
	(b)	A 1000 MW control area (1) is interconnected with a 5000 MW control area (2). The 1000 MW area has the system parameters given below, R = 2 Hz/pu MW and B = 0.01 pu MW/HZ and increase in load, ΔP_{D1} = 0.01 pu MW. Area 2 has the same parameters R and B but in terms of the 5000 MW base. Find the static frequency drop?	8	CO3
10.	(a)	Describe the solution methodology of economic load dispatch with transmission loss. What are penalty factor and incremental transmission loss?	8	CO2
	(b)	A two bus system, without generator limits, has been considered (shown in Fig. 1) where, P_{loadA} = 400 MW, P_{loadB} = 100 MW and $P_l = 0.0008(P_{gB} - 100)^2$. $(IFC)_A = 0.006P_{gA} + 4.0$ unit of cost/MWhr and $(IFC)_B = 0.007P_{gB} + 4.0$ unit of cost/MWhr. Find optimal generation for each plant and the power loss in the line.	7	CO3

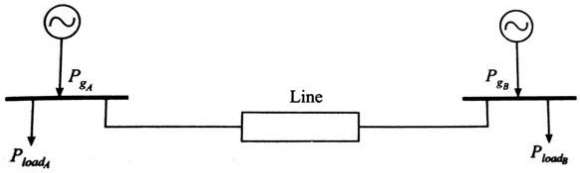

Fig. 1 A two-bus system

11.		Write short notes on any ***three*** of the following:		
	(a)	Static Var Compensator (SVC)	5	CO2
	(b)	Static Synchronous Compensator (STATCOM)	5	CO2
	(c)	FACTS	5	CO2
	(d)	Distributed and dispersed generation.	5	CO1
	(e)	Unit commitment	5	CO4