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EE 181701

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Roll No. of candidate

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BINA CHOWDHURY CENTRAL LIBRARY  
(GIMT & GIPS)  
Azara, Hatkhowapara,  
Guwahati - 781017

2022

**B.Tech. 7<sup>th</sup> Semester End-Term Examination**

**EE**

**POWER SYSTEM – IV**

**New Regulation (W.e.f. 2017 – 2018 &**

**New Syllabus (W.e.f. 2018 – 2019)**

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Answer the following (MCQ) : (5 × 1 = 5)

(A) Select the suitable

- (i) A unit when scheduled for connection to the system is said to be:
- (a) Loaded (b) Disconnected,  
(c) Committed, (d) None of the above
- (ii) The power balance equation is a
- (a) Equality constraint,  
(b) Inequality constraint,  
(c) Security constraint,  
(d) Branch transfer capacity constraint
- (iii) The pressure of high pressure boiler is
- (a) 85 bar and above (b) 50 bar  
(c) 165 bar (d) None of the above
- (iv) The basic control mechanism in power system is
- (a) LFC (b) Voltage  
(c) Both (d) None of the above
- (v) In a single area system all generators working remain in synchronism maintaining their relative power angles: such group is called as
- (a) Swing group (b) Synchro group  
(c) Coherent group (d) None of these

[Turn over

- (B) Mention either true or false (5 × 1 = 5)
- (i) A pumped storage plant is a base plant.
  - (ii) The classical unit of measuring radiations is Rontgen
  - (iii) The cost characteristics of thermal power plant is non-linear
  - (iv) The yaw control is not necessary in vertical axis wind turbine
  - (v) The ALEC loop is faster than AVR loop because of speed-governor.

2. (a) Mention different criteria used for selection of site for thermal power plant. (3)
- (b) Explain construction and working of any types of water tube boiler (medium pressure) with neat diagram. Also mention advantages. (5 + 2 = 7)
- (c) Illustrate different types of spillway used in hydro-power plant. (5)

3. (a) Show that power developed by wind turbine is given by  $P_w = \frac{1}{2} \rho A V_w^3$

Each symbol has usual meaning where  $A$  is the swept area,  $\rho$  is the density of air,  $V_w$  is the speed of wind. (7)

- (b) In a horizontal axis wind turbine the power available at the shaft of the turbine is 0.876 Kw at 40% efficiency. If the wind speed is about 5m/sec what will be Length of the blade. (3)
- (c) Explain how nuclear reactors are controlled. How nuclear reactors are shielded against radiations? (3 + 2 = 5)

4. (a) Why a moderator necessary in a reactor? What materials are suitable as moderator materials in a reactor? What should be the qualities of coolant? (2 + 1 + 2 = 5)
- (b) Deduce the expression for co-ordination equation for economic load dispatch (without considering transmission loss). (5)

- (c) The incremental cost characteristics of two thermal plants are given by

$$\frac{dC_1}{dP_{G1}} = 0.2P_{G1} + 60 \frac{Rs}{MWh}$$

$$\frac{dC_2}{dP_{G2}} = 0.3P_{G2} + 40 \frac{Rs}{MWh}$$

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Calculate the sharing of a load of 200MW for most economic operations. If the plants are rated 150MW and 250MW respectively. (5)

5. (a) A Power system operates an economic load dispatch with a system  $\lambda$  ( $\lambda$ ) of 60Rs/MWh. If raising the output of plant 2 by 100kW results in increased power losses of 12kW for the system, what is the approximate additional cost/hour if the output of this plant is increased by 1 MW? (5)
- (b) Draw a schematic diagram for Fly ball governing system and describe the operation of various parts. Make use this knowledge to find out the complete block diagram of the Fly-ball governing system. Also find out the state response of the system. (10)
6. Two generator rated 200MW and 400MW are operating in parallel. The droop characteristics of their governors are 4% and 5% from no load to load full load. Assuming that generators are operated 50Hz at no load, how would a load of 600MW be shared between them? What will be the system frequency at this load. Assume free governor operation. (10 + 5 = 15)
7. (a) Draw the block diagram for automatic excitation system and explain various parts. (7)
- (b) With neat sketch explain the concept of Pumped Storage Hydro Plant. (8)

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