Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester B.Tech (Minor) Degree Examination December 2021 (2020 admission)

Course Code: EET283

Course Name: INTRODUCTION TO POWER ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks Marks

1	What are the merits and demerits of nuclear power plants.	(3)
2	List the applications of a diesel power plant.	(3)
3	Explain the terms base load and peak load on power station.	(3)
4	The maximum demand on a power station is 90MW. If the annual load factor is 45%, calculate the total energy generated in a year.	(3)
5	What do you mean by critical disruptive voltage?	(3)
6	Derive the expression for sag at equal level supports of transmission line.	(3)
7	Explain the important transmission line parameters with simple figure.	(3)
8	What are the effects of transposing transmission line conductors.	(3)
9	Explain briefly about the feeders, distributors, and service mains in the distribution system?	(3)
10	What are the major challenges in smart grid ?	(3)

PART B

Answer any one full question from each module. Each question carries 14 marks

Module 1

11	a) Explain the classification of hydroelectric power plants based on head.	(6marks)
	b) With a neat diagram, discuss the working of any one reaction turbine used in a hydroelectric power plant.	(8marks)
12	a) With a suitable diagram, describe the elements of a gas turbine power plant.	(8marks)
	b) Explain the advantages and disadvantages of a steam power plant.	(6 marks)

Module 2

13	a) A generating station has the following data:	(7marks)

Installed capacity = 350 MW ; Capacity factor = 55% ; Annual load factor = 65% Annual cost of fuel, oil etc. = Rs 10.5×10^7 ; capital cost = Rs 10^9 ; annual interest and depreciation = 10%. Calculate (i) the minimum reserve capacity of the station and (ii) the cost per kWh generated.

b) A single phase motor connected to 400 V, 50 Hz supply takes 14.1A at a power factor of 0·75 lagging. Calculate the capacitance required in parallel with the motor to raise the power factor to 0·95 lagging. (7marks)

14 a) A 3-phase, 50 Hz, 3300 V star connected induction motor develops 250 H.P. (186·5 kW), the power factor being 0·707 lagging and the efficiency 0·86. Three capacitors in delta are connected across the supply terminals and power factor raised to 0·9 lagging. Calculate :(*i*) the kVAR rating of the capacitor bank. (*ii*) the capacitance of each unit. (7marks)

b) A generating station has a maximum demand of 20MW, a load factor of 65%, a plant capacity factor 50% and a plant use factor of 70%. Find (i) the daily energy produced, (ii) the reserve capacity of the plant and (iii) the maximum energy that could be produced daily, if the plant while running as per schedule, were fully loaded. (7marks)

Module 3

15 a) Explain the formation of corona in transmission system. Discuss the methods for reducing corona. (6marks)

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. (8marks)

16 a) Define string efficiency. Explain any one method for improving string efficiency. (6marks)

b) If the transmission line has a span of 140m between level supports. The conductor has a cross sectional area of $2.2cm^2$. The tension in the conductor is 1800kg.If the specific gravity of the conductor material is $9.9gm/cm^3$.The wind pressure is 1.4kg/m length. Calculate sag. Also determine vertical sag. (8marks)

Module 4

17 a) Derive the expression for inductance of a single phase transmission line. (6marks)

b) The three conductors of a three phase line are arranged at the corners of an equilateral triangle with sides 2.5m, 3m, and 4m. Calculate the inductance per kilometre of the line if the conductors are regularly transposed. The diameter of each conductor is 1.6cm. (8marks)

18 a) Deduce an expression for the capacitance of an unsymmetrically spaced three phase transmission line. (6marks))

b) A three phase, 50Hz, 66KV over head line conductors are placed in a horizontal plane with first and second conductor 2.5m spaced, second and third conductor 3m spaced. The conductor diameter is 1.4cm. If the line length is 120km, calculate (i) the capacitance per phase and (ii) the charging current per phase, assuming complete transposition of the line. (8marks)

Module 5

19 a) Derive an expression for the voltage drop for a DC distributor fed at one end with concentrated loading. (5marks)

b) A two wire dc distributor cable is 2km long and supplies a load of 120A, 160A,220A and 60A at 700m, 1500m, 2400m and 3000m from the feeding point A. Each conductor has a resistance of 0.02Ω per1000m.Calculate the voltage at each load point if a voltage of 260V is applied at feeding point. (9marks)

20 a) Explain smart transmission and distribution system with block diagrams. (5marks)

b) 2-wire d.c. distributor 200 metres long is uniformly loaded with 2A/metre. Resistance of single wire is 0·3 Ω/km. If the distributor is fed at one end, calculate : (i) the voltage drop up to a distance of 150 m from the feeding point (ii) the maximum voltage drop. (9marks)

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