

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2019

Course: Hydro Nuclear Power Resource Management

Program: MBA – Power Management

Course code: PIPM 7007

Instructions: Assume any data if not given

Semester: II

Time: 03 Hours

Max. Marks: 100

SECTION A

(1 * 20 = 20 Marks)

Q1	State whether the following statements are true or false : (Each question carries 1 mark)	Marks	CO
i.	Pelton Turbine is used for Low heads.	1	CO1
ii.	The overall cost of Hydro Power Plant is lower if Specific Speed (N_s) is high for a given head and output.	1	CO1
iii.	Kaplan turbine has fixed blades in place of moving blades.	1	CO1
iv.	Mechanical Efficiency of Pelton wheel decreases faster with wear and tear than Francis Turbine.	1	CO1
v.	The Output of a Hydro Power Plant is always constant.	1	CO1
vi.	The Hydro Power Plants are highly reliable and its maintenance and operation charges are very low.	1	CO1
vii.	Heavy Water is found in ordinary water in the ratio of 1:166.	1	CO1
viii.	Plutonium (Pu^{239}) Nuclear fuel is available in Australian Uranium Mines.	1	CO1
ix.	Thorium can also be used directly in Nuclear Power Reactors as a fuel in Indian Nuclear Reactors.	1	CO1
x.	Neutron Mass is more than Proton Mass.	1	CO1
xi.	Nuclear Power Plants are well suited for varying load conditions.	1	CO1
xii.	Candu Type of nuclear power reactor require enrichment of fuel uranium (235).	1	CO1
xiii.	Uranium (238) isotope is available 100 times of uranium (235) isotope in uranium.	1	CO1
xiv.	Reprocessing of used fuel in a nuclear reactor is a chemical process.	1	CO1

xv.	The weight of fission products produced in a big nuclear reactor is only about 15 ton per year.	1	CO1
xvi.	Beta particle is lighter than a proton.	1	CO1
xvii.	The energy produced in a breeder reactor is about 100 times more than the present nuclear power reactor.	1	CO1
xviii.	The cost of fuel is about 12% in the case of electricity power in a nuclear power station.	1	CO1
xix.	Gamma rays emits from outer electron orbit of an atom.	1	CO1
xx.	There are few thousands fuel pellets in the fuel core of an atomic power plant.	1	CO1

SECTION B

(4 * 5 = 20 Marks)

	Attempt any four questions. Each question carries 5 Marks .		
Q 2	Analyse all the four public perceptions about atomic energy, myths vs realities.	5	CO2
Q 3	Analyze all the six essentials of a hydro power plant in detail with diagrams	5	CO2
Q 4	Critically evaluate all seven types of nuclear power reactors with their pro and cons.	5	CO2
Q 5	Explain the diagram of a nuclear power reactor and describe its parts and their function.	5	CO2
Q 6	Critically analyze the engineering points of selecting a type of a turbine.	5	CO3

SECTION-C

(5 * 6 = 30 Marks)

	Attempt any five questions . Each question carries 6 Marks .		
Q 7	Integrate and analyse the procedures from mining, milling conversion and enrichment of Uranium ores to final fuel for Nuclear reactors.	6	CO3
Q 8	Evaluate the advantages and disadvantages of nuclear fusion. What are the technical challenges involved in development of nuclear fusion reactor for electricity generation.	6	CO3
Q 9	Critically evaluate the advantage & dis-advantage and nuclear power reactors.	6	CO3
Q 10	Critically Evaluate the Advantage & Dis-Advantage of Underground Power House	6	CO3
Q 11	Evaluate the role of prime mover in hydro power plant and how they are classified depending upon the action of water. Compare the Pelton, Francis and Kaplan water turbines.	6	CO3

Q 12	a) Critically evaluate a nuclear power plant with a steam power plant. b) Analyze the safety majors required at a nuclear power plant.	6	CO3
SECTION-D (2 * 15 = 30 Marks)			
Attempt any two questions . Each question carries 15 marks .			
Q 13	(a) For a Hydro Power Plant Following Parameters are given: Head (H) =24Meter, Speed (N) =200RPM, Discharge (Q) =8.5Cubic-Meter/Sec, Efficiency (Overall) = 88%; Calculate The Following: (i) Power Developed (P in Kw), (ii) Specific Speed (Ns), & (iii) which type of Turbine will be Selected. (b) Write down the energy from fission and full burn up equation with mass balance etc. (c) Calculate the energy per megawatt-day by burning one gram of fissionable material.	15	CO4
Q 14	(a) The mean Height of the reservoir in a pumped storage hydroelectric scheme is 568 meter. At rated load the overall Efficiency is 86%.If the Plant Operates for 5 hours, delivering 1750 Mw, (I) what mass of water has passed through the turbines? (ii) What has been the Flow rate? (b) What is the thermal energy equivalent in terms of coal to the complete fissioning of one Kg of uranium 235? (c) The fissioning of one atom of Uranium 235 has an energy 200Mev. What is the energy per fission in (i) Joules (ii) KWH?	15	CO4
Q 15	(a) How DPR is prepared of a Hydro Power Project & Explain the various important points for Submitting poor quality of DPR by the projects developers causing delays in projects. (b) Critically evaluate nuclear power plant impact on environment with the diagram of a nuclear fuel cycle and describe the process involved. (c) Analyze all the three types of nuclear waste generated in Nuclear power reactors in detail.	15	CO4
The End			

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SECTION A

(1 * 20 = 20 Marks)

Q1	State whether the following statements are true or false : (Each question carries 1 mark)	Marks	CO
xxi.	Large Hydro power projects are not eligible for renewable energy benefits as per CERC guidelines.	1	CO1
xxii.	U.S.A has maximum deposits of Uranium ores in the world.	1	CO1
xxiii.	Alpha particle has one proton and one neutron in its nucleus.	1	CO1
xxiv.	X rays emits from outer electron orbit of an atom.	1	CO1
xxv.	The cost of fuel is about 12% in the case of electricity power in a nuclear power station.	1	CO1
xxvi.	There are few thousands fuel pellets in the fuel core of an atomic power plant.	1	CO1
xxvii.	Heavy Water is found in ordinary water in the ratio of 1:166.	1	CO1
xxviii.	Plutonium (Pu) ²³⁹ Nuclear fuel is available in Australian Uranium Mines.	1	CO1
xxix.	Thorium can also be used directly in Nuclear Power Reactors as a fuel in Indian Nuclear Reactors.	1	CO1
xxx.	Proton Mass is more than Neutron Mass.	1	CO1
xxxi.	The overall cost of Hydro Power Plant is lower if Specific Speed (N_s) is high for a given head and output.	1	CO1
xxii.	Candu Type of nuclear power reactor require enrichment of fuel uranium (235).	1	CO1
xxiii.	Kaplan Turbine is used for Low heads.	1	CO1
xxiv.	Reprocessing of used fuel in a nuclear reactor is a chemical process.	1	CO1

xxv.	The weight of fission products produced in a big nuclear reactor is only about 15 ton per year.	1	CO1
xxvi.	Kaplan turbine has fixed blades in place of moving blades.	1	CO1
xxvii.	The energy produced in a breeder reactor is about 100 times more than the present nuclear power reactor.	1	CO1
xxviii.	The Output of a Hydro Power Plant is always constant.	1	CO1
xxix.	Mechanical Efficiency of Pelton wheel decreases faster with wear and tear than Francis Turbine.	1	CO1
xl.	The Hydro Power Plants are highly reliable and its maintenance and operation charges are very low.	1	CO1

SECTION B

(4 * 5 = 20 Marks)

	Attempt any four questions. Each question carries 5 Marks .		
Q 2	What is the Role of Moderator in Nuclear Power Plants? What are the properties that a moderator should possess?	5	CO2
Q 3	Describe various forms of natural radiations and man - made radiations	5	CO2
Q 4	Critically evaluate all seven types of different parameters on which nuclear power plant reactors are classified with their advantages and disadvantages.	5	CO2
Q 5	Analyse all the techniques currently available for the enrichment of Uranium. And describe them with diagrams	5	CO2
Q 6	Explain Nuclear power reactor with the suitable diagram describing its parts and their function.	5	CO2

SECTION-C

(5 * 6 = 30 Marks)

	Attempt any five questions . Each question carries 6 Marks .		
Q 7	Describe in details Radiations from a Nuclear Power Plant Effluents.	6	CO3
Q 8	Draw the diagram of a nuclear power plant indicating temperatures at different parts/points?	6	CO3
Q 9	Evaluate the advantages and disadvantages of nuclear fusion. What are the technical challenges involved in development of nuclear fusion reactor for electricity generation.	6	CO3
Q 10	What is specific speed (Ns) & How Hydro Power is calculated in watts?	6	CO3

Q 11	Analyze in details the design, special features and other provision etc. provided in Narora in Uttar Pradesh (UP) Nuclear power Plant.	6	CO3
Q 12	Analyze Fukushima, Japan Nuclear Accident details with future recommendations.	6	CO3
SECTION-D (2 * 15 = 30 Marks)			
	Attempt any two questions . Each question carries 15 marks .		
Q 13	<p>(a) A nuclear fission reaction power plant converts energy in matter to electrical energy by following energy chain</p> <p style="text-align: center;"> Energy in Thermal Mechanical Electrical Matter → Energy Energy → Energy </p> <p>Neglecting losses, how much matter is converted into electrical energy per day by a 10 mW power plant?</p> <p>(b) The maximum (peak) load on a nuclear power plant of 60 mW capacity is 50 mW at an annual load factor of 50%. The loads having maximum demands of 25 mW, 20 mW, 8 mW and, 5 mW are connected to the power station.</p> <p style="text-align: center;">Determine: (i) Average load on power station (ii) Energy generated per year (iii) Demand factor (iv) Diversity factor</p> <p>(c) Analyze the pump storage hydro power project scheme with economic benefits.</p>	15	CO4
Q 14	<p>(a) Critically evaluate nuclear power plant impact on environment with the diagram of a nuclear fuel cycle and describe the process involved.</p> <p>(b) How DPR is prepared of a Hydro Power Project & Explain the various important points for Submitting poor quality of DPR by the projects developers causing delays in projects.</p> <p>(c) Analyze all the three types of nuclear waste generated in Nuclear power reactors in detail.</p>	15	CO4
Q 15	<p>(a) What is critical mass, describe nuclear fission, and nuclear fusion.</p> <p>(b) Write down the energy from fission and full burn up equation with mass balance etc.</p> <p>(c) Calculate the energy per mega-watt-day by burning one gram of fissionable material.</p>	15	CO4
The End			