Power Plant Engineering

Week 14

Answer Key for Assessments
Final Exam

Lecturer: Dr. Melaku Desta

This exam contains two parts:

i. Multiple Choice Questions (40 Questions_2 marks each)

ii. Short Answer Questions (4 Questions_ 5 marks each)

- Total marks = 100
- Attempt all questions
- Time allotted: 90 minutes

Multiple Choice Questions

Answer Key for Multiple Choice Questions:

1. B	11. C	21. B	31. B
2. A	12. B	22. B	32. C
3. C	13. B	23. C	33. C
4. B	14. A	24. C	34. B
5. D	15. C	25. C	35. C
6. C	16. A	26. B	36. A
7. B	17. B	27. B	37. B
8. B	18. C	28. B	38. B
9. B	19. C	29. B	39. B
10. B	20. C	30. B	40. B

Answer for Short Answer Questions

1. Renewable power generation systems such as solar, wind, hydro, geothermal, and biomass utilize naturally replenished energy sources, producing little or no greenhouse gases during operation. In contrast, non-renewable systems (coal, oil, natural gas, and nuclear) rely on finite resources and are major contributors to CO_2, SO_2, NO_x, and particulate emissions. Non-renewable plants, particularly coal-fired power stations, cause air pollution, ash disposal problems, and thermal pollution. Nuclear plants, though free from greenhouse gas emissions, pose radioactive waste and safety challenges.

Answer for Short Answer Questions

2. Efficiency of power generation can be improved by advanced cycle modifications and hybrid systems. In a reheat-regenerative Rankine cycle, steam is reheated and feedwater is preheated to increase efficiency. Combined-cycle plants use gas turbine exhaust to generate steam in a steam turbine, achieving higher overall efficiency. Hybrid systems, like solar-assisted or biomass-gas turbine plants, reduce fuel use and emissions, improving both efficiency and sustainability.

Answer for Short Answer Questions

3. Engineering economy applies economic principles to evaluate costs and benefits over the life of a project. Key principles include:
    - Time value of money – accounting for interest, inflation, and discounting future cash flows.
    - Cost-benefit analysis – comparing total costs and benefits of a project.
    - Life-cycle costing – considering all costs from construction to decommissioning.

In power plants, these principles help determine whether a project is financially feasible, compare alternative designs, and guide investment decisions, ensuring optimal use of resources.

Answer for Short Answer Questions

4. Key financial indicators for power plants include:
   - Return on Investment (ROI) – measures profitability of capital investment.
   - Payback Period – time to recover initial investment.
   - Net Present Value (NPV) – present value of cash inflows minus outflows.
   - Internal Rate of Return (IRR) – interest rate at which NPV = 0.
   - Operating cost per unit of electricity – measures production efficiency.

These indicators help compare alternatives, optimize fuel use, control costs, and maximize profitability, ensuring that power generation is economically sustainable.

Thank you !