Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**Supplementary Examination – June – 2017**

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| **Code :** | **14ME2018** | **Duration :** | **3hrs** |
| **Sub. Name :** | **POWER PLANT ENGINEERING** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| Q. No. | Sub Div. | Questions | Course  Outcome | Marks |
| 1 | a. | How does re-heating differ from regeneration in thermal power plants? Support your answer with T-s plots. | CO 1 | 8 |
| b. | With T-s plots and lay-out sketches explain the working of a modified Rankine cycle employed in present-day thermal power plants. | CO 1 | 12 |
| (OR) | | | | |
| 2. | a. | Explain with a neat sketch the construction and operation of a supercritical pressure boiler used in a thermal power plant. | CO 1 | 10 |
| b. | Steam at 40 bar, 500° C flowing at the rate of 5500kg/h expands in a high pressure turbine to 2 bar with an isentropic efficiency of 83%. A continuous supply of steam at 2 bar, 0.87 quality and a flow rate of 2700 kg/h is available from a geothermal energy source. This steam is mixed adiabatically with the high pressure turbine exhaust steam and the combined flow then expands in a low pressure turbine to 0.1 bar with an isentropic efficiency of 78%. Determine the power output and the thermal efficiency of the plant. Assume that 5500 kg/h of steam is generated in the boiler at 40 bar, 500° C from the saturated feedwater at 0.1 bar. | CO 2 | 10 |
| 3. | a. | Why is water treatment essential in power plants? Describe briefly a method of feedwater treatment. | CO 1 | 10 |
|  | b. | How are condensers classified? Explain any one type with a neat sketch. | CO 1 | 10 |
| (OR) | | | | |
| 4. | a. | Compare and contrast open and closed cycle gas turbines. | CO 1 | 10 |
|  | b. | A large stationary Brayton cycle gas -turbine power plant delivers a power output  of 100 MW to an electric generator. The minimum temperature in the cycle is 300  K, and the maximum temperature is 1600 K. The minimum pressure in the cycle  is 100 kPa, and the compressor pressure ratio is 14 to 1. Calculate the power  output of the turbine. What fraction of the turbine output is required to drive the  compressor? What is the thermal efficiency of the cycle? Take Cp = 1.005 kJ/kg.K and γ = 1.4. | CO 2 | 10 |
| 5. | a. | How does a boiling water reactor differ in operation from that of a pressurized water reactor? Illustrate with neat sketches. | CO 1 | 10 |
|  | b. | Elaborate on high and low level radioactive nuclear wastes and their disposal. | CO 1 | 10 |
| (OR) | | | | |
| 6. | a. | How does power generation happen with a diesel power plant? Explain the lay-out of the plant with a neat sketch. | CO 1 | 10 |
|  | b. | Illustrate with a neat sketch the construction and operation of a pumped storage hydroelectric power plant. | CO 1 | 10 |
| 7. | a. | List the environmental hazards caused by coal and nuclear energy based power plants. | CO 4 | 10 |
|  | b. | Describe with sketches the process of fly ash removal from flue gases. | CO 4 | 10 |
| (OR) | | | | |
| 8. | a. | How does a load duration curve differ from a load curve? | CO 3 | 2 |
|  | b. | Define i) Demand factor and ii) Use factor as applied to power plants. | CO 3 | 4 |
|  | c. | The loads on a power plant with respect to time for 24 hours are tabled below.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Time, Hrs | 0 - 6 | 6 - 12 | 12 - 14 | 14 - 18 | 18 - 24 | | Load, MW | 30 | 90 | 60 | 100 | 50 |   i) Draw the load curve ii) Draw the load duration curve  iii) Calculate load factor iv) Calculate plant capacity factor | CO 3 | 14 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Explain with a neat sketch ocean thermoelectric power generation. | CO 1 | 10 |
|  | b. | How is electricity generation possible with tidal and wave power plant installations? Draw a neat sketch. | CO 1 | 10 |

ALL THE BEST