



C14-M-504

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BOARD DIPLOMA EXAMINATION, (C-14)
MARCH/APRIL—2018
DME—FIFTH SEMESTER EXAMINATION
HEAT POWER ENGINEERING—II

Time : 3 hours]

[Total Marks : 80

PART—A

3×10=30

- Instructions** : (1) Answer **all** questions.
(2) Each question carries **three** marks.
(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Define wet steam, dry steam and super-heated steam. 1+1+1
2. List out the names of any six vapour processes. $\frac{1}{2} \times 6$
3. What are the factors that influence boiler efficiency? $\frac{1}{2} \times 6$
4. Compare water tube boilers with fire tube boilers. 1+1+1
5. What is a steam nozzle? List out different types of steam nozzles. 1+2
6. State the effects of super-saturated flow of steam in a nozzle. 1+1+1
7. List out various compounding methods of steam turbine. 1+1+1
8. Write the working principle of a reaction turbine. 3

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9. Draw a line diagram of evaporative steam condenser and label the parts. 2+1
10. What is the function of an air pump in steam condenser? 3

PART—B

10×5=50

Instructions : (1) Answer *any five* questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

(4) Use of steam tables is permitted.

11. 2 kg of steam initially at a pressure of 12 bar and a temperature 250 °C expands polytropically to 1.2 bar. Find—

(a) the final condition of steam;

(b) work done;

(c) heat transfer;

(d) change in entropy.

Assume the index of expansion as 1.25.

3+2+2+3

12. Describe the working of La Mont boiler with a neat sketch and label its parts. 4+4+2

13. A boiler generates 18000 kg/hr of steam at 12 bar with 95% quality. Feed water temperature is 110 °C. Rate of coal firing is 2000 kg/hr. If HCV of coal is 27500 kJ/kg, find—

(a) the factor of equivalent evaporation;

(b) the equivalent evaporation;

(c) the thermal efficiency of generation. 4+3+3

14. Steam at a pressure of 9 bar absolute and dryness fraction of 0.9 enters a convergent divergent nozzle and leaves it at a pressure of 2 bar absolute. Find for the maximum discharge, the ratio of the cross-sectional area at throat to that of the outlet of the nozzle. Assume 10% loss of total heat drop in the divergent part of the nozzle. 10

15. (a) Describe with a neat sketch the working of a steam injector. 5
 (b) Draw the layout of a steam condensing plant by labelling important elements. 5
16. (a) Discuss with the help of simple sketches about reheating and bleeding with respect to a steam turbine. 4
 (b) Describe about nozzle control governing of a steam turbine. 6
17. A De-Laval steam turbine is supplied with 1 kg steam per second from a set of nozzles whose pressure range is 10 bar to 0.2 bar. The nozzle angle is 22° and blade exit angle is 30° . The mean blade speed is 250 m/s. If the nozzle efficiency is 80%, find (a) power developed, (b) the blade angle at inlet and (c) the blade efficiency. 7+1+2

18. Following observations were made during a trial on a steam condenser :

Barometric pressure	760 mm of Hg
Vacuum reading	690 mm of Hg
Rate of cooling water	16 kg/sec
Inlet temperature of cooling water	20 °C
Outlet temperature of cooling water	30 °C
Quantity of steam condensed	20 kg/minute
Hot-well temperature	32 °C
Mean temperature of condensate	35 °C

Determine : 2+2+3+1+2

- (a) Vacuum efficiency
 (b) Condenser efficiency
 (c) Dryness fraction of exhaust steam
 (d) Sub-cooling of condensate
 (e) Amount of air leakage per kg of steam condensed
 Assume R for air = 0.287 kJ/kg/ K and specific heat of water = 4.182 kJ/kg K
