Reg. No. : | E | N | G | G | T | R | E | E | . | C | O | M |

Question Paper Code : 50027

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Fourth Semester

Aeronautical Engineering

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AE 3402 – AIR BREATHING PROPULSION

(Regulations 2021)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   What do you mean by the term 'Air breathing Propulsion'?

2.   Write the differences between turbofan engine and ramjet engine.

3.   Define any one propeller performance parameter.

4.   List the parameters need to be considered for designing the subsonic inlets.

5.   Draw the subsonic and supersonic inlet diagrams.

6.   What do you mean by flame stabilization?

7.   Draw and show the axial flow compressor stage velocity triangle with all the notations.

8.   Define the term "Degree of Reaction" in turbomachines.

9.   Write the differences between axial and radial flow turbines.

10. List the matching parameters of compressor and turbine.

PART B — (5 × 13 = 65 marks)

11. (a)   Derive the propulsive efficiency of aircraft engine. Also explain all the performance parameters of aircraft engines.   (13)

Or

(b)   What is thrust augmentation? Explain the different methods of thrust augmentation with neat sketch.   (13)

12. (a) How starting problem in supersonic inlets will be resolved? Also explain modes of inlet operation in the aircraft engines. (13)

Or

(b) With the help of neat diagrams explain over expanded, under expanded and optimum expansion of nozzles. Also explain the concept of 'thrust reversal'. (13)

13. (a) Describe different types of combustion chamber with suitable diagram. (13)

Or

(b) Explain the combustion process in can type combustor and how cooling was achieved? (13)

14. (a) Explain centrifugal compressor working and also draw the velocity diagram. (13)

Or

(b) With the help of velocity diagrams explain the performance parameters of both centrifugal compressor and axial flow compressor. Also explain the concept 'spool mechanism' in the axial flow compressor. (13)

15. (a) Derive the analysis of axial flow turbines performance parameters. Also discuss the free vortex concept in the turbines. (13)

Or

(b) Explain the design steps involved in axial flow turbine. Also derive the work done equation. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Consider any aircraft engine and with the help of neat diagrams prepare a case study in such a way that it should cover the following data: (i) Working principle (ii) Parts and its description (iii) Advantages and limitations (iv) Recent developments (v) Future scope. (5 × 3 = 15)

Or

(b) Consider any axial flow compressor and prepare the case study on the same. It should cover the following: (i) velocity triangles (ii) blade design (iii) efficiency increasing parameters. (5 + 5 + 5)

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