C–8145	Sub. Code 11823

B.Sc. DEGREE EXAMINATION, APRIL 2023.

Second Semester

Aeronautical Science

MATHEMATICS – II

(2016 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

1. Verify that $\int_1^2 \int_0^1 (x^2 + y^2) dx\, dy$

2. Find the area between the circle $x^2 + y^2 = a^2$ and the line $x + y = a$ lying in the first quadrant by double integration.

3. Define gradient of scalar point function.

4. Find the unit normal to the surface $x^3 - xyz + z^3 = 1$ at the point $(1, 1, 1)$.

5. Define Laplacian operator.

6. State any two properties of an analytic function.

7. Prove that $\perp(\sin at) = \frac{a}{s^2 + a^2}$.

8. State the conditions for the existence of laplace transform of a function.

9. Define mean deviation.

10. Define Rank correlation.

Part B $(5 \times 5 = 25)$

Answer **all** questions.

11. (a) Express $\int_0^a \int_y^a \frac{x^2 dxdy}{(x^2+y^2)^{3/2}}$ in polar coordinates and then evaluate it.

Or

(b) Evaluate $\int_0^1 \int_0^{1-z} \int_0^{1-y-z} xyz\, dxdydz$

12. (a) When $\phi = x^3 + y^3 + z^3 - 3xyz$, find $\nabla\phi, \nabla.\nabla\phi$ and $\nabla \times \nabla\phi$ at the point (1, 2, 3)

Or

(b) Show that

$\overline{F} = (y^2 + 2xz^2)\vec{i} + (2xy - z)\vec{j} + (2x^2z - y + 2z)\vec{k}$ is irrotational and hence find its scalar potential.

13. (a) Prove that every analytic function $W = u(x,y) + iv(x,y)$ can be expressed as a function of z alone.

Or

(b) Determine the analytic function $f(z) = u + iv$, given that $3u + 2v = y^2 - x^2 + 16xy$.

14. (a) If $L^{-1}\left\{\frac{s}{(s^2+1)^2}\right\} = t/2 \sin t$, find $L^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\}$

Or

(b) Find the laplace transform of $\sqrt{\frac{t}{\pi}}$ and hence find $L\left\{\frac{1}{\sqrt{\pi t}}\right\}$.

15. (a) Compute the mean and standard deviation for the following data: 5, 8, 7, 11, 9, 10, 8, 2, 4, 6.

Or

(b) If x and y are two variables prove that the correlation co-efficient between $ax+b$ and $cy+d$ is $\gamma_{ax+b,\, cy+d} = \frac{ac}{|ac|}\gamma_{xy}$ if $a, c \neq 0$.

Part C (3 × 10 = 30)

Answer **all** questions.

16. (a) Verify stokes theorem for $\overline{F} = -y\bar{i} + 2yz\bar{j} + y^2\bar{k}$, where S is the upper half of the sphere $x^2+y^2+z^2=a^2$ and C is the circular boundary on the xoy-plane.

Or

(b) Express the volume of the sphere $x^2+y^2+z^2=a^2$ as a volume integral and hence evaluate it.

17. (a) Find the image of the triangular region in the z-plane bounded by the lines $x=0$, $y=0$ and $x+y=1$ under the transformation (i) $w=2z$ and (ii) $w = e^{i\pi/4} - z$.

Or

(b) If $f(z) = u + iv$ is a regular function of z, prove that $\nabla^2 [\log |f(z)|] = 0$.

18. (a) Using convolution theorem to evaluate the following $\int_0^t u^2 e^{-a(t-u)} du$.

Or

(b) Calculate the rank correlation coefficient for the following data:

x :	10	12	18	18	15	40
y :	12	18	25	25	50	25

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C–8146	Sub. Code 11824

B.Sc. DEGREE EXAMINATION, APRIL 2023.

Second Semester

Aeronautical Science

ENGINEERING MECHANICS AND STRENGTH OF MATERIALS

(2016 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

1. State Lami's theorem.

2. Define the principle of transmissibility of force.

3. Differentiate between couple and moment.

4. What do you understand by mass moment of inertia?

5. Define linear momentum and angular momentum.

6. What is polar moment of inertia?

7. Write the work-energy equation of particles.

8. State impulse-momentum principle.

9. Define stiffness.

10. What is meant propped cantilever beam?

Part B (5 × 5 = 25)

Answer **all** questions.

11. (a) Write a short note on Parallelogram law of forces.

Or

(b) Explain about principle of virtual work.

12. (a) Explain about D'Alembert's Principle and momentum impulse.

Or

(b) Write a short note on simple harmonic motion of Vibrations.

13. (a) Explain about types of bearings and its uses.

Or

(b) Write short notes on thin cylinder subjected to internal pressure.

14. (a) Explain about the method of joints of solving a truss.

Or

(b) Explain perfect frame and imperfect frames with help of neat sketch.

15. (a) Draw Stress - Strain curve and explain salient points.

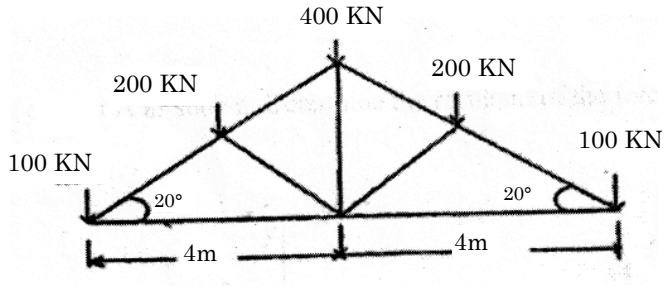
Or

(b) Write short notes on End conditions of Euler theory of column.

Part C (3 × 10 = 30)

Answer **all** questions.

16. (a) Find the forces and their nature in various members of the truss shown



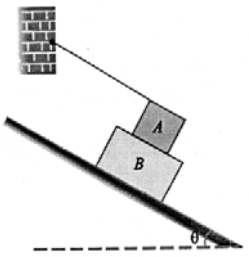
Or

(b) Forces 32KN, 24KN, 24KN and 120KN are concurrent at origin (0,0,0) and are respectively directed through the points whose coordinates are, A (2,1,6), B (4, –2, 5), C (–3, –2, 1) and D (5, 1, –2). Determine the resultant of the system

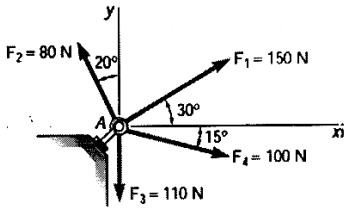
17. (a) A wheel is attached to the shaft of an electric motor of rated speed of 2000 rpm. When the power is switched on, the wheel attains the rated speed in 10 seconds and when the power is switched off, the unit comes to rest in 100 seconds. Assume uniformly accelerated motion and determine the number of revolutions the unit turns (i) to attain the rated speed and (ii) to come to rest.

Or

(b) Two blocks A and B of weight 100 N and 300 N respectively are resting on a rough inclined plane as shown in Fig. Find the value of the angle (θ) when the block B is about to slide. Take coefficient of friction between the two blocks as well as block B and the inclined plane as 0.25

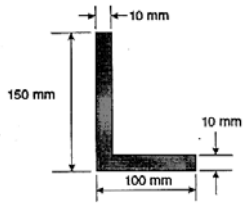


18. (a) Four forces act on bolt A as shown. Determine the resultant of the forces on the bolt.



Or

(b) Calculate the principal moment of inertia of the section shown in Fig. about x and y axes through the centroid.



C–8147	Sub. Code
	11835

B.Sc. DEGREE EXAMINATION, APRIL 2023

Third Semester

Aeronautical Science

AIRCRAFT CONSTRUCTION

(2016 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

1. Define the term load factor.

2. What is the function of wing rib.

3. What is the need for the control surface in the aircraft?

4. What do you mean by power assisted controls?

5. Name four types of brakes used in aircraft.

6. Define wheel pants.

7. What are the sources where weight and balance data can be obtained from?

8. Define C.G of an aircraft.

9. Why does the levelling of the aircraft require?

10. What methods may be used to determine when an aircraft is level?

Part B (5 × 5 = 25)

Answer **all** questions.

11. (a) Define aircraft station numbers. Write in detail about any two of them.

Or

(b) Write in detail about monocoque.

12. (a) How does the aileron differential control achieve?

Or

(b) Explain the types of tabs.

13. (a) Discuss about non absorbing landing gear.

Or

(b) Explain the following:

(i) Torque link

(ii) Swivel gland

14. (a) Discuss about the electronic weighing equipment.

Or

(b) Write about the calculation for empty weight of C.G.

15. (a) Discus about fixed surface alignment check.

Or

(b) Write down the procedure the levelling of the aircraft.

Part C

$(3 \times 10 = 30)$

Answer **all** questions.

16. (a) Write in detail about the types of the aircraft fuselage with suitable diagram.

Or

(b) Explain in detail about shimmy dampers types and inspection.

17. (a) Discuss in detail about procedure for Weighing an aircraft.

Or

(b) Inspection and maintenance of the control system.

18. (a) (i) Explain the theory of weight and balance.

(ii) Short notes on landing gear retraction system.

Or

(b) Explain about fly by wire system with suitable diagrams.

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C–8148	Sub. Code 11842

B.Sc. DEGREE EXAMINATION, APRIL 2023

Fourth Semester

Aeronautical Science

AIRCRAFT SYSTEMS

(2016 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define Pascal's Law.

2. Write the purpose of Accumulator and its types.

3. Write the application of High-Pressure Pneumatic system.

4. What is the purpose of Pressure Reducing Valve and its applications?

5. Write the role of Heat Exchanger in Air-conditioning system.

6. Discuss the role of water separator in the Boot-strap air cycle machine.

7. Define de-icing and anti-icing.

8. Write the purpose of de-icer boots.

9. List out the important fuel requirements of aviation fuel.

10. What is gravity feed fuel system and its application?

Part B (5 × 5 = 25)

Answer **all** questions.

11. (a) With neat sketch explain the hydraulic actuator types and its application.

Or

(b) Explain the flow control valves used in hydraulic system.

12. (a) List out advantages and dis-advantages of pneumatic system.

Or

(b) With neat sketch, explain the block diagram of medium size aircraft pneumatic system.

13. (a) Explain about the various components of pressurisation system.

Or

(b) Write the operating principle of Boot-strap air cycle machine.

14. (a) What is wind shield wiper and application of de-icing system?

Or

(b) Describe the thermal de-icing system used in modern aircraft.

15. (a) Explain the twin engine fuel system of aircraft.

Or

(b) List out the precautions to be followed while refuelling aircraft.

Part C (3 × 10 = 30)

Answer **all** questions.

16. (a) Describe the various components of multi-engine aircraft fuel system.

Or

(b) List out the various sub-divisions of air-conditioning system of an aircraft.

17. (a) Write short notes on (i) Priority valve (ii) operation of sequence valve.

Or

(b) Write short notes on (i) Properties of hydraulic fluid. (ii) Operation of selector valve.

18. (a) Explain about the purpose of seals and it is classification.

Or

(b) Write notes on (i) Fuel Contamination check (ii) Fuel jettisoning operation.

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C–8149	Sub. Code 11843

B.Sc. DEGREE EXAMINATION, APRIL 2023

Fourth Semester

Aeronautical Science

AIRCRAFT INSTRUMENTS

(2016 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. List out three principal methods by which data may be displayed.

2. What is digital display?

3. Define ISA.

4. What is atmospheric temperature?

5. What is called apparent drift?

6. What is the purpose of Fast Erection System?

7. What is pressure switch?

8. Write the two categories of Temperature measuring indicating system.

9. What are the errors in Compass Systems?

10. Write the two types of aircraft magnetism.

Part B (5 × 5 = 25)

Answer **all** questions

11. (a) Write the significance of director displays.

Or

(b) Discuss about the dual indicator displays.

12. (a) How to protect the pitot-static tube against icing.

Or

(b) Write construction details of Air Speed Indicator.

13. (a) What do you understand by Erection rate?

Or

(b) What is Bank Indication?

14. (a) Write short notes on Thermo resistor.

Or

(b) Discuss about the Integrated flow meter system.

15. (a) Write notes on Effects of magnetic components on Compass.

Or

(b) Write the Components of Soft-Iron Magnetism?

Part C (3 × 10 = 30)

Answer **all** questions.

16. (a) Explain about the "Q" code for altimeter setting.

Or

(b) Describe about the Straight Scale Display.

17. (a) Explain the constructional details of VSI.

Or

(b) Describe about the Pneumatic operating gyroscope?

18. (a) Explain about the location and connection of tank probes?

Or

(b) Briefly discuss about the Compass Deviation Coefficients?

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C–8150	Sub. Code
	11844

B.Sc. DEGREE EXAMINATION, APRIL 2023

Fourth Semester

Aeronautical Science

AIRCRAFT MATERIALS, HARDWARE AND NDT

(2016 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What are the types Aluminium alloys?

2. What are advantages of Copper?

3. What is normalization of material?

4. State the reasons for corrosion.

5. What are advantages of wood as a material?

6. What are disadvantages of plastics used in aircraft?

7. Define composite material.

8. What is honeycomb construction?

9. Define creep.

10. Mention any two NDT techniques.

Part B (5 × 5 = 25)

Answer **all** questions

11. (a) Explain the need for alloy instead of pure metals.

Or

(b) What are the properties of Magnesium and Nickel alloys?

12. (a) Explain the types of corrosion and treatments to avoid it.

Or

(b) Explain different types of hardening.

13. (a) Classify and explain the types of plastics.

Or

(b) Explain types of components used in aircraft constructions

14. (a) Explain the sandwich construction and state its advantages and disadvantages.

Or

(b) Explain the few types of composite materials based on type of fibers.

15. (a) Explain the Eddy current inspection.

Or

(b) Explain Brinell and Rockwell hardness test.

Part C

$(3 \times 10 = 30)$

Answer **all** questions

16. (a) Explain the advantages and disadvantages of Aluminium and mention few applications in aircraft.

Or

(b) Explain the metal spraying and Chrome plating.

17. (a) Explain the need of materials like wood and plastics in aircraft construction.

Or

(b) Explain hand layup technique used for making composite laminates.

18. (a) Explain the need for finding the fatigue strength and methods used for measuring the fatigue strength.

Or

(b) Explain Ultrasonic and Radiography techniques used in NDT.

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C–8151	Sub. Code 11861

B.Sc. DEGREE EXAMINATION, APRIL 2023

Sixth Semester

Aeronautical Science

AIRCRAFT MAINTENANCE GROUND HANDLING AND SUPPORT EQUIPMENTS

(2016 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Write short note on 100 Hrs. inspection.

2. What is Airworthiness?

3. What is the function of ribs?

4. What is the function of nose wheel?

5. What are the functions of aircraft spar?

6. What is the formulae for calculating the Number of rivets required on each side of the break?

7. What are three things needed to start the fire?

8. Why jacking is required?

9. What is pre oiling?

10. What are the precautions while handling compressed air?

Part B (5 × 5 = 25)

Answer **all** questions

11. (a) Write in detail about the pre-flight inspection to be done on aircraft.

Or

(b) Explain about the continuous airworthiness inspection.

12. (a) Discuss about the alignment of the main gear wheels.

Or

(b) Write about the inspection after heavy landing.

13. (a) Discuss the classification of the structural damage.

Or

(b) Describe the rivet Lay out.

14. (a) Discuss the procedure for the pressure fuelling process.

Or

(b) Describe various types of fire extinguishing agents.

15. (a) Write short notes on electrical power unit.

Or

(b) Explain about the pre oiling equipment.

Part C (3 × 10 = 30)

Answer **all** questions.

16. (a) Describe in detail about the annual inspection procedure.

Or

(b) Briefly explain demounting and mounting of Tire over the wheel.

17. (a) How to determine the rivet diameter needed for the repair work.

Or

(b) Explain the taxing operation procedure and precautions to be followed.

18. (a) Explain about electrical power unit and tow bars.

Or

(b) Describe Aircraft mooring procedure in detail.

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C–8152	Sub. Code 11862

B.Sc. DEGREE EXAMINATION, APRIL 2023.

Sixth Semester

Aeronautical Science

AERO ENGINE MAINTENANCE

(2016 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Write the two processes of cleaning engine parts?

2. What are the roles of magnifying glass for piston engine checks?

3. Write the basic propeller Principles?

4. What are the various forces acting on propeller blade?

5. What is the importance of battery ignition system?

6. What is Ignition Harness?

7. What is the importance of radial cracks in combustion chamber?

8. What do you understand the Checking the clearance of turbine section?

9. What are the adjustments of throttle control system?

10. Write the significance of initial warm-up of engine?

Part B (5 × 5 = 25)

Answer **all** questions.

11. (a) List out the measurements for Dimensional inspections of the Cylinder barrel?

Or

(b) Write the Visual inspections of connecting rod.

12. (a) Write short notes on automatic propeller.

Or

(b) Write the significance of propeller Lubrication.

13. (a) Write three important components of spark Plug.

Or

(b) Write short notes on ignition checks.

14. (a) What are the importance of Convergent-Divergent nozzle?

Or

(b) What are the causes for compressor blade damage?

15. (a) Write short notes on engine Tachometer check.

Or

(b) Write the basic principles of fuel flow indicator.

Part C (3 × 10 = 30)

Answer **all** questions.

16. (a) Describe about the principle of operation of pitch change mechanism.

Or

(b) List out the typical procedure for replacement of ignition harness.

17. (a) Write notes on Carbon fouling and Lead fouling of spark plug.

Or

(b) Discuss about the combustion chamber cracks.

18. (a) Briefly explain about the EGT indicator.

Or

(b) Write the functional checks of aircraft EGT circuit.

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C–8153	Sub. Code 11863

B.Sc. DEGREE EXAMINATION, APRIL 2023

Sixth Semester

Aeronautical Science

AIRCRAFT COMMUNICATION AND NAVIGATION SYSTEM

(2016 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

1. Define ground waves?

2. What are the terms of frequency band?

3. What frequency range is utilized for VHF communication system?

4. What is the function of AIRCOM?

5. What is null position?

6. What is MLS?

7. What frequencies are used by an ELT?

8. Write the major components of TCAS?

9. Define radar bands?

10. What precaution must be taken with respect to painting a radome?

Part B $(5 \times 5 = 25)$

Answer **all** questions

11. (a) Explain the types of microphones with neat diagram?

Or

(b) Explain with the block diagram of radio transmitter?

12. (a) Briefly explain the Aircraft Selcal system?

Or

(b) Write the theory of operation of HF communication system?

13. (a) Describe the operation of Doppler Navigation System?

Or

(b) Explain about Global Positioning System?

14. (a) Describe the operation of a flight data recording system?

Or

(b) Explain briefly about radar altimeter?

15. (a) Describe safety precaution that must be observed in the operation of radar on the ground?

Or

(b) Describe the operation of Plan Position Indicator?

Part C

$(3 \times 10 = 30)$

Answer **all** questions.

16. (a) Explain one of the most modern reliable communication systems used in aircraft with a block schematic.

Or

(b) Explain with the block diagram of super heterodyne receiver and its operation.

17. (a) Explain the principle of Inertial Navigation system?

Or

(b) Describe the operation of a typical flight data recording system?

18. (a) Describe the clear function of the parabolic and flat-plate antenna system?

Or

(b) Explain the working operation of MLS?

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C–8154	Sub. Code 11864

B.Sc. DEGREE EXAMINATION, APRIL 2023

Sixth Semester

Aeronautical Science

AIRPORT AND AIR TRAFFIC SERVICES

(2016 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is Airspace?

2. What is aerodrome reference point?

3. Define “TODA”.

4. Define “Runway”.

5. List out the terminal configurations.

6. Write the significance of Airport Slot.

7. What is Aerodrome Beacon?

8. What is PAPI and its significance?

9. What are the objectives of Air Traffic services?

10. What is the purpose of Distance Measuring Equipment?

Part B (5 × 5 = 25)

Answer **all** questions

11. (a) List out the functions of ICAO.

Or

(b) What is Clear Way and its importance?

12. (a) List out the objectives of Layout of apron.

Or

(b) Write the significance of Holding Apron.

13. (a) List out the sources of airport revenue.

Or

(b) Write short notes on "Airport Slot".

14. (a) Write the importance of Obstruction Lighting System.

Or

(b) Write the procedures to be followed for power supply to aerodrome lighting system.

15. (a) What is Flight Plan and its importance?

Or

(b) What are the purposes of Instrument Landing system (ILS)?

Part C (3 × 10 = 30)

Answer **all** questions.

16. (a) List out the Air Space Classes and ATS routes.

Or

(b) Write the functions of IATA.

17. (a) Write short notes on Taxiway Markings.

Or

(b) Write short notes on

(i) Airport Gate Capacity

(ii) Ramp Safety

18. (a) List out the precautions to be observed while fueling.

Or

(b) Write short notes on

(i) X-ray Unit

(ii) Lounge Area Requirements

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C–8155	Sub. Code 11865

B.Sc. DEGREE EXAMINATION, APRIL 2023

Sixth Semester

Aeronautical Science

TRAVEL AND TOUR MANAGEMENT

(2016 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is Vertical Integration?

2. What is retail Travel Agency?

3. What are the types of Itinerary?

4. What is a Passport? Write its types.

5. What is the role of Travel agents in tourism and travel?

6. What is Special Interest Tours?

7. What is Horizontal Diversification?

8. What is MICE?

9. Write the components of Tourism.

10. Write any two functions of PATA.

Part B (5 × 5 = 25)

Answer **all** questions

11. (a) Distinguish the characteristics of Retail and Wholesale Travel Agency.

Or

(b) Write short notes on American Express company.

12. (a) Write short notes on Health Documents and Travel Insurance.

Or

(b) What is visa? Explain different types of Visa.

13. (a) Write short notes on Group Tour Planning and its components.

Or

(b) Write short notes on FIT.

14. (a) What are the sources of income for a Travel Agency?

Or

(b) Differentiate Travel Agency and Tour Operation business.

15. (a) Discuss the objectives and activities of TAAI.

Or

(b) What is IATO and explain its roles and function.

Part C (3 × 10 = 30)

Answer **all** questions.

16. (a) Which are the roles and characteristics of a Large tour operator.

Or

(b) Explain the various sectors in Travel Industry.

17. (a) Define Itinerary Planning. List the steps required for planning a Tour Itinerary.

Or

(b) Classify Tour Packages and explain the components of tour package in detail.

18. (a) Discuss the functions of a Travel Agency.

Or

(b) Explain the roles and responsibility of Travel Trade Associations.

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