

B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

AIRCRAFT ELECTRICAL SYSTEM

(2008 Onwards)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. State ohm's law and kirchoff's laws.
2. List the factors affecting resistance of a conductor.
3. Write the principal functions of battery.
4. How power is distributed in twin engine type aircraft ?
5. What are the two ways to monitor the output of a generator ?
6. What are the needs of protective devices
7. Describe how wire bundles should be routed in an aircraft.

8. What is trouble shooting ?

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Explain in detail about types of circuits with neat diagram.

(Or)

(b) Compare a solenoid with an electromagnet.

10. (a) Write notes on circuit control devices.

(Or)

(b) (i) Explain the construction of nickel-cadmium battery and its chemical action.

(ii) What are the advantages of nickel-cadmium battery over lead acid battery ?

11. (a) Explain the construction and purpose of a generator with a neat diagram.

(Or)

(b) Draw neat diagrams of three types of self-excited generators and list out their characteristics.

12. (a) Explain about anti-collision light with its types.

(Or)

(b) Describe the typical terminals used with aircraft electric wire or cable.

13. (a) Explain-Multimeter troubleshooting.

(Or)

(b) Write in detail about CRO and its functions.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

TOOLS AND PRECISION INSTRUMENTS

(Upto 2007 Batch)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Why it is dangerous to run a machine from which the guards have been removed ?
2. How should work be held for drilling ?
3. What is the purpose of washer and what type of washers are used in aircraft?
4. What do you understand by precision Instruments ?
5. Write short notes on combination set ?
6. What is the purpose of Reamer and name the various types ?

7. How screw drivers are classified ? What is the purpose of stubby screw driver ?
8. What is the principle of operation of electric arc welding ?

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Draw a neat diagram of vernier calipers and explain the theory of vernier scale ? what is the principle advantage of a vernier caliper ?
- (Or)*
- (b) Explain “Fit”. Name the three main types of fits, with their uses and suitable sketches ?
10. (a) Draw a neat diagram of a hand hammer and explain briefly about classification of hammers ?
- (Or)*
- (b) Sketch and describe a hacksaw. Where are the all hard and flexible blades are used ?

11. (a) Name and explain the use of different types of chisels used in a fitting work giving their specification ?

(Or)

(b) What do you understand by limit gauging ? Distinguish between workshop and inspection gauges ?

12. (a) Explain in detail the Basics for Aircraft Nut installation ?

(Or)

(b) Describe taps and write the uses and also mention how a tap drill size is derived ?

13. (a) What are the rules for safe use of files ?

(Or)

(b) What is interchangeability ? How does it influence production.

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B.Sc DEGREE EXAMINATION, APRIL 2010**Aeronautical Science****WORKSHOP PRACTICES****(Upto 2007 Batch)**

Duration : 3 Hours

Maximum : 75 Marks

Part - A**(5 × 3 = 15)**Answer any **Five** questions.

1. Define Drilling and Reaming.
2. Mention various parts of Lathe.
3. Mention the purpose of Lead screw on Lathe.
4. Mention the purpose of Idler gear.
5. Mention various types of gears.
6. Define soldering
7. Mention the types of equipments for welding plant.

8. Mentiion the principle of sheet wone.

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Explain various safety precautions to be followed on machine shop.

(Or)

(b) Explain various tools used on drilling, Reaming operations.

10. (a) Explain the operation and use of feed and thread cutting mechanism

(Or)

(b) Explain the construction of Engine Lathe with a neat diagram.

11. (a) Explain the types of gears and its applications.

(Or)

(b) Explain the types of bearings and their purposes.

12. (a) Explain soldering and brazing.

(Or)

(b) Explain eight types of welded joints and welding faults.

13. (a) Explain the calculation of bend allowance for different bend angles.

(Or)

(b) Explain the principle of sheet metal work.

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B.Sc DEGREE EXAMINATION, APRIL 2010**Aeronautical Science****METALS AND ALLOYS, HEAT TREATMENT NDT AND
CORROSION****(Upto 2007 Batch)**

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Mention the alloys of copper and their properties.
2. What are the classification of materials ?
3. Define Annealing.
4. Define Hardenability.
5. What is the importance of Izod Impact Test ?
6. Briefly explain magnoflex inspection of NDT.
7. Write the causes of corrosion.

8. Explain the principle of Anodizing.

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Explain SAE steel Numbering system for carbon steels.

(Or)

(b) Write Briefly on copper and its alloys.

10. (a) Explain about Annealing and its types.

(Or)

(b) Write Notes on :-

(i) Carburising

(ii) Cyaniding.

11. (a) What is Hardness ? What is the purpose of using a hardness Tester ? Explain any one hardness Testing Machine.

(Or)

(b) Explain about creep and Fatigue Tests.

12. (a) Write briefly about dye Penetrant Inspection.

(Or)

(b) Write short notes on :-

(i) Radiography and

(ii) Magnoflex inspection.

13. (a) Explain the principle of Electroplating and the process involved in it ?

(Or)

(b) Write short notes on :-

(i) Metal spraying process

(ii) Chromate Treatment.

B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

BASIC ELECTRICITY AND MAGNETISM

(Upto 2007 Batch)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Explain the term magnetization.
2. What are electromagnets ? Explain.
3. Distinguish resistance from conductance.
4. Discuss the term static electricity.
5. Define electromotive force of a circuit.
6. What are the applications of a voltage regulators ?
7. State and explain the kirchoff's laws of electricity.
8. What is a ripple factor.

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) What are the solenoids ? Calculate the self inductance of a long solenoid.

(Or)

- (b) Explain the principle and operation of generators.

10. (a) What is photoelectric effect ? Give the laws of photoelectric effect. Explain the photoelectric equation.

(Or)

- (b) (i) Explain the structure of an atom.

- (ii) Discuss static electricity.

11. (a) Describe the construction and working of a full wave rectifier.

(Or)

- (b) Discuss the use of a Zener diode as a voltage regulator.

12. (a) (i) What are series and parallel circuits.
- (ii) How does a multimeter measure the D.C. voltage.
- (Or)*
- (b) Describe the construction and working of a oscilloscope.
13. (a) Describe the working of an induction motor.
- (Or)*
- (b) With neat block diagram, explain the principle and working of A.C. generators.

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B.Sc. DEGREE EXAMINATION, APRIL 2010**Aeronautical Science****MATHEMATICS - II****(Upto 2007 Batch)**

Time : 3 Hours

Maximum : 75 Marks

Part-A

(5 × 3 = 15)

Answer any **five** questions.

1. Show that $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2} = 4$.

2. Find $\frac{\partial u}{\partial x}$, $\frac{\partial u}{\partial y}$, $\frac{\partial^2 u}{\partial x^2}$, $\frac{\partial^2 u}{\partial xy^2}$ if $u = e^{x-y}$.

3. Evaluate $\int_0^1 \int_0^{x^2} (x^2 + y^2) dy dx$.

4. Show that the lines

$$\frac{x-2}{1} = \frac{y-4}{2} = \frac{z-5}{2} \text{ and } \frac{x-5}{2} = \frac{y-8}{3} = \frac{z-7}{2}$$

are coplanar.

5. Find the centre and radius of the sphere $2x^2 + 2y^2 + 2z^2 - 2x + 2y - 4z - 5 = 0$.

6. Show that the vectors $3\vec{i} + 2\vec{j} - 2\vec{k}$, $5\vec{i} - 3\vec{j} + 3\vec{k}$ and $5\vec{i} - \vec{j} + \vec{k}$.

7. Find the vectors equation of the straight line passing through the points having position vectors $2\vec{i} - \vec{j} + 3\vec{k}$ and $\vec{i} + \vec{j} - 2\vec{k}$.
8. Find the rank of :

$$A = \begin{bmatrix} 3 & -1 & 2 \\ 0 & 1 & -3 \\ 6 & -1 & 1 \end{bmatrix}.$$

Part-B

(5 × 12 = 60)

Answer **All** Questions.

9. (a) If $u = \log (x^2 + y^2 + z^2)$ prove that

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = \frac{2}{x^2 + y^2 + z^2}.$$

(Or)

- (b) Find the Jacobian for the transformation

$$x = r \sin \theta \cos \phi$$

$$y = r \sin \theta \sin \phi$$

$$z = r \cos \theta.$$

10. (a) Evaluate $\iiint_V (x + y + z) dx dy dz$ where the region V is bounded by $x + y + z = a$ ($a > 0$), $x = 0$, $y = 0$, $z = 0$.

(Or)

- (b) Find the area enclosed by the curve $y^2 = 4ax$ and the line $x + y = 3a$, $y = 0$.

11. (a) Find the equation of the plane passing through $(2, 2, 1)$ and $(9, 3, 6)$ and perpendicular to the plane $2x + 6y + 6z = 9$.

(Or)

- (b) Find the image of the point $(2, 3, 4)$ under the reflection in the plane $x - 2y + 5z = 6$.

12. (a) Find the unit vector perpendicular to both

$$\vec{a} = \vec{i} + 2\vec{j} + 3\vec{k} \text{ and } \vec{b} = \vec{i} - \vec{j} - \vec{k}$$

(Or)

- (b) If $\vec{a} = 2\vec{i} + 3\vec{j} - \vec{k}$, $\vec{b} = -2\vec{i} + 5\vec{k}$, $\vec{c} = \vec{j} - 3\vec{k}$.

verify that $\vec{a} \times (\vec{b} \times \vec{c}) = (\vec{a} \cdot \vec{c}) \vec{b} - (\vec{a} \cdot \vec{b}) \vec{c}$.

13. (a) Find the inverses of the matrix

$$A = \begin{bmatrix} 3 & 3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$$

(Or)

- (b) Solve the equations

$$x + 2y + 5z = 23$$

$$3x + y + 4z = 26$$

$$6x + y + 7z = 47$$

by inverse method.

B.Sc DEGREE EXAMINATION, APRIL 2010
Aeronautical Science
NON METALS AND AIRCRAFT HARDWARE
(Upto 2007 Batch)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Describe about thermosetting plastic.
2. Write short note on seasoning of wood.
3. Explain the types of fabrics.
4. List out the advantages of composite materials.
5. Explain briefly British standard of identification marking on metals.
6. Write short note on locking pins.

7. Define.

- (a) Thinners
- (b) Primers
- (c) Karnishes.

8. Write short note on Reinforcing Fibres.

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) What are plastics ? Explain the classification of plastics in detail.

(Or)

(b) Explain the working properties of plastics in detail.

10. (a) Briefly explain 'Strength of wood'.

(Or)

(b) Explain.

(i) Bending of wood.

(ii) Kiln drying of wood.

11. (a) What is doping ? Explain the purpose and procedure of doping.

(Or)

(b) Explain the procedure of testing the soundness of fabric material.

12. (a) Explain the various types of washers ?

(Or)

(b) Explain briefly about non self locking nuts and self locking nuts.

13. (a) Write the advantages and disadvantages of composites.

(Or)

(b) Explain the application of composites in Aircraft industry.

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B.Sc. DEGREE EXAMINATION, APRIL 2010**Aeronautical Science
FLUID MECHANICS
(Upto 2007 Batch)**

Time : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **five** questions.

1. Define surface tension and viscosity in fluids.
2. What are the uses of hydraulic press and hydraulic jacks.
3. Explain the forces acting on a submerged plane.
4. Explain the laws of floatation.
5. Explain steady and unsteady motions.
6. State the linear momentum and angular momentum theorems.
7. Explain the laminar and turbulent flows.
8. Explain skin friction concepts.

Part - B

(5 × 12 = 60)

Answer **All** questions.

9. (a) (i) State and explain Pascal's law.
- (ii) Explain the uses of manometers. Derive an expression for pressure difference measurement by a U tube manometer.

(Or)

- (b) (i) Define specific gravity and vapour pressure.
- (ii) Explain the dependence of pressure over depth of a water medium. Explain gauge and absolute pressure.

10. (a) A venturimeter having a throat diameter 38.9 mm is installed in a line having an inside diameter 102.3 mm. Water is allowed to flow. Density of water is 999 kg/m³ pressure drop across the Venturimeter is 156.9 kPa. Venturi coefficient is 0.98. Calculate volumetric flow rate.

(Or)

- (b) Explain the principle of operation of a pitot tube and indicate how it can be used in order to measure the total flow rate of fluid in a duct. If the pitot tube is inserted in a pipe of circular cross section in which the fluid is in a stream line flow, calculate at what point in cross section it should be inserted so as to give direct reading of the mean velocity of the flow of the fluid.

11. (a) Define the centre of gravity. Explain the metacentric height and its use. Discuss the stability of the submerged body.

(Or)

- (b) Explain buoyancy. Discuss the stability of floating body. Explain the laws of floatation.

12. (a) State and explain Euler's equation. Derive Bernoulli's theorem.

(Or)

- (b) State and explain the linear momentum theorem and angular momentum theorem.

13. (a) A liquid is flowing through a horizontal pipe of diameter 0.525 m and length 1m with a velocity of 4.57 m/s. The viscosity of the liquid is 4.46 CP and the density is 801 kg/m³. Calculate the friction. The friction factor is 0.006

(Or)

- (b) A small capillary with an inside diameter of 2.22×10^{-3} m and a length of 0.317 m is being used continuously to measure the flow rate of a liquid having a density of 875 kg/m³ and viscosity of 1.13×10^{-3} Pa. The pressure drop reading across the capillary during the flow is 0.0655 m water of density 996 kg/m³. What is the flow rate in m³/s if end effects correction are neglected.

B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeromantical Science

APPLIED MECHANICS AND STRENGTH OF MATERIALS

(Upto 2007 Batch)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Explain fundamental units and derived units with examples.
2. Find the resultant of two forces 3N and 2N acting at an angle of 120° . Find also its direction.
3. Explain the principle of transmissibility.
4. Define moment of force. Explain the method of determining the moment of force about a point.
5. Explain mechanical advantage and efficiency of simple machines.
6. Explain deficient and redundant frames.

7. Define factor of safety and give its significance.
8. Distinguish closed coil spring from open coil spring.

Part - B (5 × 12 = 60)

Answer **All** the questions.

9. (a) (i) Explain the law of parallelogram of forces to find the resultant of forces. (6)
- (ii) Two forces of magnitudes 3N and 2N respectively have a resultant R. If the first force is doubled, the magnitude of the resultant is doubled. Find the angle between the two forces. (6)
- (Or)*
- (b) (i) Explain couple, moment of a force, arm and axis of a couple. (6)
- (ii) Discuss the principle of virtual work. (6)
10. (a) (i) Define centroid and centre of gravity. (4)
- (ii) Explain the moment of inertia of a solid body. (4)
- (iii) Describe the simple harmonic motion. (4)

(Or)

- (b) (i) Describe the motion of a projectile in a plane. (8)
- (ii) If the greatest height attained by a projectile is one quarter of its range on the horizontal plane, show that the angle of projection is 45° . (4)

11. (a) (i) State the laws of friction. (4)
- (ii) Define coefficient of friction and angle of friction. (4)
- (iii) The coefficient of static friction between the tires of a car and a dry road is 0.6. If the mass of the car is 1500 kg. What maximum braking force is obtainable. (4)

(Or)

- (b) (i) Explain rolling resistance. How are friction is reduced in bearings. (6)
- (ii) Give the working of a jack and find its mechanical advantage. (6)

12. (a) Discuss the analytical methods of finding out forces in frames. (6)

(Or)

(b) Give the analysis of the structure with one end hinged and other freely supported on rollers and carrying horizontal load. (6)

13. (a) Explain in detail how shear-force and bending moment diagrams are constructed and interpreted for a concentrated load.

(Or)

(b) (i) Explain how Mohr's circle is used to determine principal stresses.

(ii) Using Mohr's circle. find the principal stresses for the case with $\sigma_x = 80$, $\sigma_y = 20$ and $\ell_{xy} = -40 \text{ kg/cm}^2$

B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

MACHINE DRAWING

(Upto 2007 Batch)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Mention the differences between first angle projection and Third angle projection.
2. Define cycloid with an example.
3. Mention the types of fits. Explain any two of them.
4. Mention various terminology of screw threads.
5. Mention different types of couplings.
6. Give a neat sketch of helical gear and give one application.

7. Mention the purpose of

- (i) Connecting rod
- (ii) Crank shaft

8. State some simple machine parts assembled in Aircraft.

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Construct an ellipse by Rectangle method of measurements
100mm × 70mm.

(Or)

(b) Explain different types of drawing Instruments.

10. (a) Draw the isometric view of the following orthographic
views.

(Or)

(b) Explain in detail about

- (i) Orthographic projection
- (ii) Isometric projections
- (iii) Mention their differences.

11. (a) Explain different types of lines used in machine drawing.

(Or)

(b) Discuss in detail about Limits, Fits, Tolerances.

12. (a) Sketch a protected type flange coupling for 80mm diameters shaft.

(Or)

(b) Sketch a Flexible coupling of diameter 80mm.

13. (a) Draw a neat sketch of crank shaft with free hand.

(Or)

(b) Explain the terminology of screw threads.

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B.Sc DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

MECHANICS OF FLIGHT

(Upto 2007 Batch)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Define atmosphere and its types ?
2. What are the various aerodynamic force acting on aircraft ?
3. Define streamline airflow.
4. Define aerofoil.
5. What is the role of area of the wing for production of lift ?
6. What is dynamic pressure and its significance ?
7. What is called flutter ?

8. Write the three axis control of the aircraft and its related component.

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Explain about the various altitudes ?

(Or)

- (b) What are the effect change in pressure, density and temperature in atmosphere ?

10. (a) Write short notes about wind tunnel ?

(Or)

- (b) What is effect of venture effect and its applications ?

11. (a) Describe about airfoil characteristics ?

(Or)

- (b) Write the significance of 4 digit-2534 and 5 digit-35648 NACA airfoil ?

12. (a) How will you minimize induced drag and its effect ?

(Or)

(b) Explain about the various lift augmentation devices ?

13. (a) What is Dutch roll and its effect ?

(Or)

(b) Explain the *** lateral stability of the aircraft ?

B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

BASIC ELECTRONICS

(2007 Batch)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Explain half wave rectifier operation ?
2. Explain the construction details of N-channel EFT.
3. How do we bias FET ?
4. Explain any one application of DIAC with diagram.
5. Draw the equivalent circuit of an OP-AMP.
6. What is flip-flop ?
7. State de Morgan's theorem.
8. What is called Demultiplexer ?

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Describe the construction and working of Diode and give its characteristics.

(Or)

- (b) Explain in detail.

- (i) Field emission
- (ii) Secondary emission
- (iii) Photo electric emission

10. (a) Draw the equivalent circuit of SCR and explain its important terms.

(Or)

- (b) Describe the construction and working of Triac and explain its V-I characteristics.

11. (a) Draw the circuit diagram of RC coupled single stage amplifier and explain its working.

(Or)

- (b) Describe the working of class A push pull amplifier and determine its power gain.

12. (a) Describe the operation of different logic gates with their logic diagram and truth table.

(Or)

- (b) Discuss the working of J-K master slave flip-flop with its function table and what are its advantages over J-K flip-flop.

13. (a) Explain the successive approximation method of ADC.

(Or)

- (b) Describe the weighted resistor method of DAC.

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B.Sc. DEGREE EXAMINATION, APRIL 2010**Aeronautical Science****AIRFRAME STRUCTURE****(Upto 2007 Batch)**

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Define tension stress ?
2. What are the components used for the construction of a Airframe and How it is joined ?
3. Write the primary control surfaces used in account ?
4. Define "Tab".
5. What are the features of electrical landing gear retraction system ?
6. What is shock strut ?

7. Write the various types of weighing equipment ?
8. What is the purpose of symmetry check ?

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) What are the advantages and disadvantages of Honeycomb construction ?

(Or)

- (b) Describe about the “wing spar”.

10. (a) Explain various Auxillary wing Flight surfaces.

(Or)

- (b) Describe about the fly-by-wire system.

11. (a) Describe construction features of “Master Brake cylinder used in account Brake system.

(Or)

- (b) Describe the procedure of Landing gear retraction test ?

12. (a) Briefly explain the various weighing equipments ?

(Or)

(b) What are the requirements for weighing account and write the contents of weight Balance report ?

13. (a) Describe about surface boral measurement ?

(Or)

(b) Write short notes on:-

(i) Checking Dihedral

(ii) Checking freighter

(iii) Wing and fuselage alignment.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science
AIRFRAME SYSTEMS
(Up to—2007 Batch)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions

1. What is an integral fuel tank ?
2. Explain the difference between De-icing and Anti-icing system.
3. What is hypoxia and how it is effected to human body ?
4. How the shuttle valve comes in operation when emergency under carriage selection is made ?
5. Why Fuel Jettisom is done ?
6. Why seals are used in hydraulic system ? What are the main classification of seals ?

7. What are the sources of compressed air supply is used for cabin pressurisation ?

8. What is the purpose of a hydraulic Reservoir ?

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) List down the steps to be taken to control Aviation Fuel Contamination.

(Or)

(b) What are the causes of Fuel system contamination ? Explain briefly.

10. (a) What is thermal Anti-icing system ? Explain how Anti-icing is done by combustion heaters ?

(Or)

(b) With the help of Schematic diagram explain the hydraulic wind shield wiper system ?

11. (a) What is the purpose of water separator and how it operates ?

(Or)

(b) What is the purpose of refrigeration unit and how it operate ?

12. (a) With help of a sketch explain the function of a Micromic type hydraulic filter ?

(Or)

(b) What are the purpose and functions of hydraulic accumulator and describe its type.

13. (a) Write down the advantages and disadvantages of pneumatic system over hydraulic filter.

(Or)

(b) Explain different characteristics and properties of Aviation Gasoline (AVGAS)

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

PISTON ENGINE AND PROPELLER

(Upto 2007 Batch)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Define Geometric pitch of propeller.
2. Why super charging is important for piston engines. Explain
3. Define “Spark plug reach”.
4. What is the purpose of flow dividers.
5. What is valve overlap. Give its importance.
6. Describe the causes of pre-ignition.
7. Define the term “flash point” in reference to engine oil.

8. Draw the P-V and T-S diagram for otto cycle and explain the salient points.

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) With a neat sketch explain the working principle of Two- stroke recyrocating engine.

(Or)

- (b) Explain the working principle of carnot cycle with pres sure-volume and Temperature-Entropy variation.

10. (a) Briefly discuss the liquid cooling methods adopted four piston engines.

(Or)

- (b) Explain the working of a internal super charge with a neat sketch.

11. (a) With a neat sketch explain the main metering system of a float type carburetor.

(Or)

- (b) Discuss the procedure for idle speed adjustments in a fuel injection system.

12. (a) Explain the over running clutch type starting system with a neat diagram.

(Or)

(b) Explain the dry sump lubrication system in detail.

13. (a) Explain briefly the various forces acting on a propeller during flight.

(Or)

(b) Discuss the blade element theory in detail.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

TURBINE ENGINE

(Upto 2007 Batch)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Write the difference between Air-breathing and Non-air breathing engine.
2. Define propulsive efficiency.
3. What is compresor stall ?
4. What is the purpose of FCU ?
5. List the main components of a Gasturbine Ignition system.
6. What is a free turbine unit ?

7. Name four types of starters used in Gas turbine engines.
8. What is the function of the scavenge pump ?

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Discuss about Brayton cycle with P-V and T-S diagram.

(Or)

- (b) Explain the construction and working of a Turbofan engine with a neat sketch.

10. (a) Describe the working of Axial flow compressors in detail.

(Or)

- (b) Explain the thrust Augmentation devices in detail.

11. (a) With a neat sketch explain the working of propeller control unit.

(Or)

- (b) Explain the procedure to calculate the horsepower of a Turbo propeller.

12. (a) Explain the functions of a FCU in detail.

(Or)

(b) Explain the working of various types of fuel spray nozzles.

13. (a) Explain the various components of a Turbine engine lubrication system.

(Or)

(b) With a neat sketch explain the Gasturbine Ignition system.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

AIRCRAFT INSTRUMENTS

(Upto 2007 Batch)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. State the difference between qualitative and quantitative displays, and quote some examples of instruments to which they are applied.
2. What do you understand by term “ISA” ? State also the assumptions made.
3. Express the formulae used for the calculation of deviation coefficients A, B & C.
4. What are the ‘input’ and ‘output’ axes of a gyroscope ?
5. Why is it necessary to install a number of sensing probes in a fuel tank system ?

6. Define.
- (i) Gyroscope
 - (ii) Rigidity and
 - (iii) Precession.
7. Name the components of 'hard iron' magnetism and the axes about which they are effective.
8. Why is the speed of turbine engines measured as a percentage ?

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Describe the construction and operation of an Altimeter.

(Or)

- (b) Describe the operation of a basic type fuel flow indicating system.

10. (a) What are the precautions to be observed while handling oxygen equipment ?

(Or)

- (b) State the errors in Airspeed indicator and how these are corrected ?

11. (a) Briefly explain the operation of Direction Indicator during a turn.

(Or)

(b) What are compass errors and how they are compensated ?

12. (a) With the aid of diagrams show the dial presentation of Artificial Horizon during :

(i) a left bank.

(ii) a climb and descent

(Or)

(b) How ASI is range marked ? Mention the colours normally used to indicate them.

13. (a) With a neat sketch explain the layout of instrument panel of aircraft and the grouping of various instruments.

(Or)

(b) Explain the physical structure of atmosphere in detail.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

AIRCRAFT ELECTRICAL SYSTEM

(Upto 2007 Batch)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions

1. What are the characteristics should be observed while choosing Electric wires for Aircrafts use ?
2. What do you mean by Primary Cell and Secondary Cell ? What are the main differences between them ?
3. What is the purpose of using static dischargers in Aircrafts and where the static dischargers are commonly fixed in Aircrafts ?
4. What are the methods of field Excitation in D.C generators ?
5. What do you mean by bonding and what is the purpose of doing bonding in Aircrafts ?

6. What is the purpose of providing Connectors, Vent Plugs and separators in a battery ?

7. Differentiate between a Fuse and a Circuit Breaker. Why Circuit Breakers are preferred to use in Aircrafts ?

8. Explain in detail about Conductors, Semiconductors and Insulators ?

Part - B

(5 × 12 = 60)

Answer **All** questions

- 9.(a) Explain with neat diagram the principle of operation of a Lead Acid Cell. Express the necessary chemical actions ? (12)

(Or)
- (b) Explain the Constructional details of Nickel Cadmium cell with necessary Chemical actions ? (12)

10. (a) Write short notes of the following :- (3 marks each)
 - (i) Navigational lights (Position lights)
 - (ii) Anti Collision lights.
 - (iii) Landing lights.
 - (iv) Instrument panel lights.

(Or)

- (b) (i) What are all the safety precautions to be observed while servicing Aircraft batteries. (4 marks each)
- (ii) What is the difference between relay and solenoid ?
- (iii) How will you verify the state of charge of a leadacid battery?

11. (a) What do you mean by voltage regulators ? What are the common types of voltage regulators used in Aircrafts ?
Explain in detail about one ? (12)

(Or)

- (b) (i) What are the identification methods involved for identifying the Aircraft cables ? (4 marks each)
- (ii) What are the advantages of crimping over soldering ?
- (iii) Draw the symbols of the following neatly.
 - (a) Generator
 - (b) Motor
 - (c) Rectifier
 - (d) Relay
 - (e) Circuit Breaker
 - (f) Transistor

12. (a) (i) What are Built in Test Equipment (BITE). Explain in detail the role of BITE in Modern Aircrafts ? (8)
- (ii) What do you mean by Intercum and Interphone Systems in Aircrafts ? (4)

(Or)

- (b) (i) Explain with neat diagram the principle of operation of a Voltaic Cell ? (4 marks each)
- (ii) What do you mean by Negative Earth return system in Aircraft ? Explain.
- (iii) What is the advantage of compound wound generators over series wound and shunt wound ?

13. (a) Explain the Constructional details of a D.C. generator with all components with necessary diagrams ? (12)

(Or)

- (b) What do you mean by CSD Unit ? Explain in detail about CSD Unit used in Aircrafts ? What is the difference between on CSD and IDG ? (12)

B.Sc DEGREE EXAMINATION, APRIL 2010
AERONAUTICAL SCIENCE
AIRCRAFT RULES AND
AIRWORTHINESS REGULATIONS
(UPTO 2007 BATCH)

Duration: 3 Hours

Maximum: 75 Marks

Part - A

(5 x 3 = 15)

Answer any FIVE Questions

1. Define:
 - a. Aerodrome
 - b. Aeroplane
 - c. Flight time
2. Explain Section 9A of Aircraft Act 1934.
3. What is the application procedure and demonstrating capability of organization for type certificate as per CAR 21?
4. What type of characters are used for nationality and registration marking?

5. What are the qualification and duties of Nodal officer?
6. What is the qualification and experience requirement for instructors of approved training institutes of AME?
7. What precautions are to be observed during refuelling to guard against static electricity?
8. What are the safety precautions to be taken against fire hazards during fuelling?

Part - B

(5 x 12 = 60)

Answer ALL Questions

9. a. State different types of penalties under Aircraft Act 1934.

(OR)

- b. Which rules are related to registration of Aircraft? Explain briefly.

10. a. What is Export C of A? State application and issue procedure for Export C of A

(OR)

- b. What is the application and issuance procedure for type certificate and restricted type certificate? Also state type certificate basis.

11. a. Which log books shall be kept and maintained for all Aircrafts? Explain JLB in detail.

(OR)

b. What is the application procedure for registration of Aircraft? State locations for Nationality and Registration marking.

12. a. State qualification, experience requirement and duties of

- i. Accountable manager
- ii. QCM and Dy. QCM
- iii. Nodal Officer

(OR)

b. Give short notes:

- i. Period of AME Training
- ii. Semester examination of AME
- iii. AME license examination conducted by DGCA.

13. a. Explain Aircraft fuelling procedure in detail.

(OR)

b. Give a short note on testing of Aviation products as per car series H.

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B.Sc. DEGREE EXAMINATION, APRIL 2010**Aeronautical Science****AIRCRAFT MAINTENANCE****(Upto 2007 Batch)**

Time : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **five** questions.

1. Define "Maintenance".
2. What is the purpose of Dihedral board ?
3. What are the various types of corrosion ?
4. Write the various kinds of inspections to be carried out in a/c structure.
5. Define turnbuckle.
6. What are the effects of out of Balance of control surface ?
7. What is the function of shimmy damper and its types.
8. What is snubber ?

Part - B

(5 × 12 = 60)

Answer **All** questions.

9. (a) Explain with neat diagram the principle of operation of a lead acid cell. Express the necessary chemical actions.

(Or)

(b) Explain the constructional details of Nickel cadmium cell with necessary chemical actions.

10. (a) Write short notes of the following : (4 × 3 = 12)

(i) Navigational lights (position lights)

(ii) Anti-collision lights.

(iii) Landing lights.

(iv) Instrument panel lights.

(Or)

(b) (i) What are the safety precautions to be observed while servicing Aircraft batteries ? (3 × 4 = 12)

(ii) What is the difference between relay and solenoid ?

(iii) How will you verify the state of charge of a lead acid battery ?

11. (a) What do you mean by voltage regulators ? What are the common types of voltage regulators used in Aircrafts ? Explain in detail about me ?

(Or)

(b) (i) What are the identification methods involved for identifying the Aircraft cables ? (3 × 4 = 12)

(ii) What are the advantages of crimping over soldering ?

(iii) Draw the symbols of the following neatly :

a) Generator b) Motor c) Rectifier.

12. (a) (i) What are Built in Test Equipment (BITE). Explain in detail the role of BITE in Modern Aircrafts ? (8)
- (ii) What do you mean by Intercom and Interphone systems in Aircrafts ? (4)

(Or)

- (b) (i) Explain with neat diagram the principle of operation of a voltaic cell ?
- (ii) What do you mean by Negative Earth return system in Aircraft. Explain ?
- (iii) What is the advantage of compound wound generators over series wound and shunt wound ?
13. (a) Explain the constructional details of a D.C. generator with all components with necessary diagrams ? (12)

(Or)

- (b) What do you mean by CSD unit ? Explain in detail about CSD unit used in Aircrafts ? What is the difference between an CSD and IDG ? (12)

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B.Sc. DEGREE EXAMINATION, APRIL 2010
AERONAUTICAL SCIENCE
AERO ENGINE MAINTENANCE
(UPTO 2007 BATCH)

Duration : 3 Hours

Maximum : 75 marks

Part - A

(5 x 3 = 15)

Answer any FIVE Questions

1. What is the purpose of crankshaft ?
2. Define propeller slip.
3. What is the purpose of propeller governor ?
4. What is the engine warm up procedure ?
5. Write the location of Exhaust section and its significance.
6. What is 'compressor wash' ?
7. What is the principle of typical starter motor used in piston engine ?
8. What is the significance of ground check ?

Part - B

(5 x 12 = 60)

Answer ALL Questions

9. a. What are the maintenance practices to be followed during forced landing ?

OR

- b. Describe scheduled maintenance.

- 10.a. What are the special checks to be carried out for forced landing ?

OR

- b. Describe the aircraft structural alignment checks.

- 11.a. What are the inspections to be carried out in typical flight control system ?

Or

- b. Briefly explain the adjustment of control surface.

- 12.a. Write the procedure of alignment of main gear wheel.

OR

- b. Explain the Graniz method of bleeding the brake.

13.a. Write the riveting practice of

- i. Rivet size
- ii. Rivet spacing

OR

b. Write the procedure for removal of rivet in damaged sheet metal.

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B.Sc. DEGREE EXAMINATION, APRIL 2010
Aeronautical Science
AIRCRAFT COMMUNICATION AND NAVIGATION
SYSTEM

(Upto 2007 BATCH)

Time : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. What is the frequency range of HF and VHF Communication System ?
2. What is RMI ? What are the informations a RMI provide ?
3. What is VOR ? State the advantages of VOR.
4. What are the different functions of a receiver ?
5. What is known as resolution of a radar system ?
6. What are the precautions to be observed while installing an avionic equipment ?
7. What are the different lamp indications and identification codes provided by markers ?
8. What are the advantages of Doppler navigation system ?

Part - B

(5 × 12 = 60)

Answer **All** questions.

9. (a) What is Inertial Navigation System ? Explain.

(Or)

(b) Explain the operation of Radar Altimeter.

10. (a) What is DME ? Explain the operation of DME.

(Or)

(b) What is ILS ? Explain with diagram.

11. (a) Explain the operation of VOR with a suitable block schematic diagrams of ground beacon and a receiver in the aircraft.

(Or)

(b) (i) What are the general safety precautions to be observed around a radar installation ?

(ii) What are the various controls associated with the weaker radar control panel ?

12. (a) Explain VHF communication system with a neat block schematic diagram.

(Or)

(b) Explain different types of carrier waves with associated diagram.

13. (a) Why testing of a communication system is important ? Explain the testing procedure of a communication system.

(Or)

- (b) Explain the principle of operation of ADF with a suitable block diagram.

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B.Sc DEGREE EXAMINATION, APRIL 2010
AERONAUTICAL SCIENCE
AIRCRAFT RULES AND
AIRWORTHINESS REGULATIONS II
(UPTO 2007 BATCH)

Duration: 3 Hours

Maximum: 75 Marks

Part - A (5 x 3 = 15)

Answer any FIVE Questions

1. Briefly explain the various categories of MEL.
2. Define ELT.
3. Write short notes on Journey Log Book.
4. What is the minimum experience required for renewal of AME license?
5. What are the occasions when the special flight permit is granted?
6. What is removable equipment?
7. What is meant by calibration of Instruments?
8. What is the Qualification required by a pilot who carry out test flight of gliders?

Answer ALL Questions

9. a. Explain in detail about First aid kit and Physician kit.

(OR)

- b. Under what circumstances GPWS should provide warning to the crews?

10. a. Explain the procedure to get special flight permit.

(OR)

- b. Explain the procedure to obtain authorization / approval.

11. a. Explain in detail the procedure for flight test.

(OR)

- b. Write down the procedure for renewal of AME license.

12. a. Explain preventive maintenance and differentiate between on condition and condition monitoring maintenance.

(OR)

- b. Explain the instructions / precautions for safe loading of an aircraft.

- 13.a. i. What are the requirements and functions of the person occupying the exit seat?
- ii. Write short notes on “Crew composition”.

(OR)

- b. Explain in detail about operation - manual.

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B.Sc DEGREE EXAMINATION, APRIL 2010
AERONAUTICAL SCIENCE
INDUSTRIAL MANAGEMENT
(UPTO 2007 BATCH)

Duration: 3 Hours

Maximum: 75 Marks

Part - A

(5 x 3 = 15)

Answer any FIVE Questions

1. What is strategic planning?
2. What is forecasting?
3. What do you understand by Authority?
4. What are the advantages of coordination?
5. What are the duties of a supervisor?
6. What are the principles of effective managerial communication?
7. What are the purposes of managing office records?
8. What do you mean by production planning and control?

Answer ALL Questions

9. a. Explain in detail the different functions of management.

(OR)

- b. What are the different types of planning? What are their advantages?

- 10.a. Critically examine the significance of different types of organizational structure.

(OR)

- b. Explain the different steps in Manpower planning.

- 11.a. What are the principles of decision making? Explain the process of decision making.

(OR)

- b. What are the barriers of communication? Explain the strategies to overcome it.

- 12.a. Explain in detail how to manage office correspondence.

(OR)

- b. Discuss in detail the steps involved in production planning and control.

13.a. What is Ergonomics? What are the ergonomic principles used in the design of a work system?

(OR)

b. What are the various types of Inventory? How will you manage those inventories?

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B.Sc. DEGREE EXAMINATION, APRIL 2010
Aeronautical Science
AIRPORT AND AIR TRAFFIC SERVICES
(UPTO 2007 BATCH)

Duration: 3 Hours

Maximum: 75 Marks

Part - A

(5 x 3 = 15)

Answer any FIVE Questions

1. What are navigational aids ? Give two examples.
2. What is airport ?
3. What are the goods prohibited for carriage by air ?
4. Differentiate between runways and taxiways.
5. What do you mean by LCN?
6. What is the importance of X-ray unit at airport ?
7. What is apron ?
8. What is PAPI ?

Part - B

(5 x 12 = 60)

Answer **All** Questions.

9. a. i. Write short notes on obstruction light and airport beacon. (4)

ii. Explain holding apron and terminal apron. (8)

(Or)

b. Explain aircraft parking configuration. (12)

10.a. Explain VFR and IFR operations. (12)

(Or)

b. Explain runway marking and taxiway markings. (12)

11. a. (i) Write short notes on VASI and PAR. (6)

(ii) What are the different compositions of airport fire and rescue services ? (6)

(Or)

b. i. What are the general safety precautions to be observed around a radar installation? (6)

ii. What are the various controls associated with the weather radar control panel? (6)

12.a. Explain VHF communication system with a neat block schematic diagram. (12)

(Or)

b. Explain different types of carrier waves with associated diagrams. (12)

13.a. Why testing of a communication system is important? Explain the testing procedure of a communication system. (12)

(Or)

b. Explain the principle of operation of ADF with a suitable block diagram. (12)

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B.Sc. DEGREE EXAMINATION, APRIL 2010
Aeronautical Science
GROUND HANDLING SAFETY AND SUPPORT
EQUIPMENT
(Upto—2007 Batch)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. How an aircraft is tied down on soft ground ?
2. What precautions are taken before towing of an aircraft ?
3. Describe the fire extinguishing agents not recommended for aircraft use. State the reasons ?
4. Describe water and water based fire extinguishing agents ?
5. Describe pre oiling unit.
6. How man power is distributed for jacking up of an aircraft ?

7. Describe mobile refueller.

8. Describe water contamination of fuel ?

Part - B

(5 × 12 = 60)

Answer **All** questions.

9. (a) How Helicopter is secured to ground ?

(Or)

(b) How sea planes and aircraft fitted with skis are secured ?

10. (a) Describe standard towing procedure ?

(Or)

(b) Describe location of a marshaller and standard instructions given to a marshaller in receiving an aircraft.

11. (a) Discuss different classes of fire Vs extinguishing agents ?

(Or)

(b) Discuss markings of fire extinguishers with diagrams.

12. (a) Discuss ground Airconditioning and heating units of support equipments ?

(Or)

(b) Discuss aircraft jacking up procedure ?

13. (a) Discuss fuel contamination precautions and single point pressure refueling ?

(Or)

(b) Discuss various reasons for four sediments in fuel system.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science
TECHNICAL ENGLISH
(2008-Onwards)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions

1. Add either a Prefix or Suffix to the following words :

- (a) add
- (b) fix
- (c) locate.

2. Give the antonyms of :

- (a) active.
- (b) forward.
- (c) undo.

3. Rewrite as directed :

- (a) Truth —— (triumph) over evil one day.

(Put the verb within bracket in the correct form and tense)

- (b) 'Everything has been received in good condition' replied the manager (Put in Active voice)
- (c) Who is —— (good) of the two, Ramesh or Ramam ? (Put the adjective in bracket in the correct degree of comparison)

4. Define Boly Language with an illustration.

5. Put the following sentences in correct order :-

- (a) He moves through the woods in vast armies whose power of destruction is incredibly great.
- (b) He is the most courageous and most disciplined of all creatures.
- (c) The soldier ant well deserves his name.

6. Put the words in brackets in Proper Places :

(authoritative, autocratic, autonomous)

- (a) When an information is reliable, it is said to be ——.
- (b) When a ruler is dictatorial, he is ——.
- (c) When a person or institution acts independently, we say it is ——.

7. Write any three components of a letter of application.

8. Name any three types of Interviews.

Part - B

(5 × 12 = 60)

Answer **All** questions

9. (a) What is word formation ? How can you elaborate on it ?

(Or)

(b) Write short notes on FOUR of the following :

- (i) Adjectives.
- (ii) Gerunds.
- (iii) Prepositions.
- (iv) Passive voice.
- (v) Nominal Compounds.

10. (a) Give a few guidelines for achieving vocabulary development.

(Or)

(b) What is communication across cultures ?

11. (a) Bring out the most commonly used techniques for paragraph Development.

(Or)

(b) Write a Paragraph on :

The uses and Abuses of Internet

12. (a) Write an essay on the advantages, limitations, style, structure and content of E mails.

(Or)

(b) Write a letter of application to a firm you would like to work with.

13. (a) Analyse the various skills required for facing various kinds of Interviews.

(Or)

(b) Write short notes on the following presentation strategies :-

- (i) Analysing audience and locals.
- (ii) Defining Purpose.
- (iii) Organising Contents.

B.Sc. DEGREE EXAMINATION, APRIL 2010**Aeronautical Science****MATHEMATICS - I****(2008 onwards)**

Time : 3 Hours

Maximum : 75 Marks

Part-A

(5 × 3 = 15)

Answer any **five** questions.

1. Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 4 \\ 7 & 10 & 11 \end{bmatrix}$.
2. Show that a matrix A and its transpose A^T have the same eigen values.
3. Find the equation of the plane which bisects at right angles the join of (1, 3, -2) and (3, 1, 6).
4. Find the foot of the perpendicular drawn from the point (1, 0, -3) to the line $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$.
5. Find the radius of curvature to the curve $y = e \cos h\left(\frac{x}{c}\right)$ at the point where it crosses y-axis.
6. If $x = r \cos \theta$, $y = r \sin \theta$, find $\frac{\partial(x, y)}{\partial(r, \theta)}$.

7. Solve $(D^2 + 6D + 9)y = e^{-3x}$.
8. Solve $(D^2 - 4D + 3)y = \sin 3x$.

Part-B

$(5 \times 12 = 60)$

Answer **All** the questions.

9. (a) Test for the consistency of the following system equations and solve them, if consistent $3x + y + z = 8$; $-x + y - 2z = -5$; $x + y + z = 6$; $-2x + 2y - 3z = -7$.

(Or)

- (b) Find the eigen values and eigen vectors of the matrix

$$A = \begin{bmatrix} 2 & 0 & -1 \\ 0 & 2 & 0 \\ -1 & 0 & 2 \end{bmatrix}.$$

10. (a) Find the length and equations of the shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$.

(Or)

- (b) Find the equations of the tangent planes to the sphere $x^2 + y^2 + z^2 - 4x - 2y - 6z + 5 = 0$ which are parallel to the plane $x + 4y + 8z = 0$. Find also their point of contact.

11. (a) Find the evaluate of the curve $x^{2/3} + y^{2/3} = a^{2/3}$.

(Or)

- (b) Find the Evaluate of the parabola $x^2 = 4ay$.

12. (a) (i) If $u = xy + yz + zx$, $x = e^t$, $y = e^{-t}$ and $z = \frac{1}{t}$, find $\frac{du}{dt}$.

(ii) If $u = f(x, y)$, where $x = r \cos \theta$ and $y = r \sin \theta$, prove that

$$\left(\frac{\partial u}{\partial x}\right)^2 + \left(\frac{\partial u}{\partial y}\right)^2 = \left(\frac{\partial u}{\partial r}\right)^2 + \frac{1}{r^2} \left(\frac{\partial u}{\partial \theta}\right)^2.$$

(Or)

(b) Discuss the extrema of the function $f(x, y) = x^2 - 2xy + y^2 + x^3 - y^3 + x^4$ at the origin.

13. (a) (i) Solve $(D^2 + 6D + 9)y = e^{-2x} x^3$.

(ii) Solve $(x^2 D^2 + 4xD + 2)y = e^x$.

(Or)

(b) Solve $\frac{dx}{dt} + 4x + 3y = t$,

$$\frac{dy}{dt} + 2x + 5y = e^t.$$

B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

PRODUCTION TECHNOLOGY

(2008 Onwards)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Mention any 5 shop safety precautions to be followed, while working on lathe by a Aeronautical Engineer.
2. Mention any four functions of Lathe
3. Discuss the principle of metallic arc welding with a neat sketch.
4. Mention various tools used during metallic arc welding by a Aeronautical Engineer.
5. Discuss various sheet metal tools.

6. Define :

(a) Milling

(b) Bearings.

7. Mention the types of bearings and their functions.

8. Define interchangeability.

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Explain various shop safety precautions to be followed in machine shop by a Aeronautical Engineer.

(Or)

(b) Explain the types of Lathe.

10. (a) Explain the principle of Gas welding.

(Or)

(b) Explain safety precautions to be followed during Arc welding.

11. (a) Explain various sheet metal tools used in the Fabrication of Aircraft parts.

(Or)

(b) Explain various sheet metal operations.

12. (a) Explain the principles of gear mesh pattern with a neat sketch and uses.

(Or)

(b) Explain the basic operation of numerical control machines.

13. (a) Explain the working principle of screw gauge with a neat sketch.

(Or)

(b) Explain inter changeability and Indian standard system.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

**ENGINEERING MECHANICS AND STRENGTH OF
MATERIALS**

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions

1. Write the classification of system of force.
2. Write the types of couple.
3. Define Newton's Second Law of Motion.
4. Write D'Alembert's Principle.
5. Write the types of friction ?
6. What is Belt drive ?
7. Define Frame.
8. Define Poisson ratio ?

Part - B

(5 × 12 = 60)

Answer **All** questions

9. (a) Write short notes on

- (i) Parallelogram Law.
- (ii) Triangle law of forces.

(Or)

(b) Write short notes on :

- (i) Moment of force.
- (ii) Moment of vertical force.
- (iii) Moment of Horizontal force.

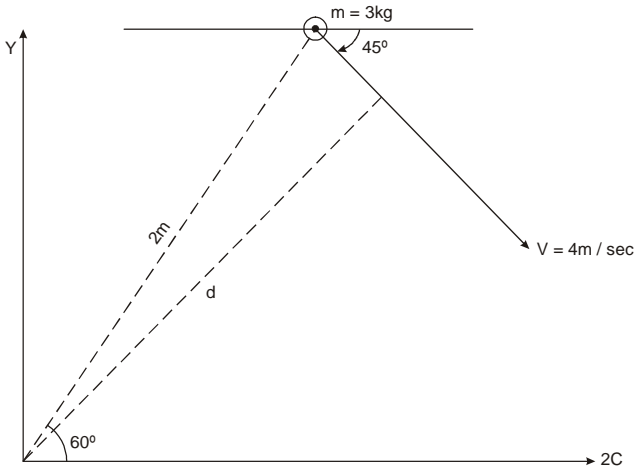
10. (a) Describe Impulse-momentum principle.

(Or)

(b) 3 kg particle moves in a Horizontal plane and has the Indicated velocity of a particular Instant as shown in Fig. Determine

- (i) Linear Momentum.
- (ii) Angular momentum about point “O”.

(iii) Kinetic energy.



11. (a) Describe about the wedge friction ?

(Or)

(b) Describe the Lubrication of Bearings ?

12. (a) Describe the Analysis of cantilever trusses by method of joints?

(Or)

(b) Describe about the method of sections.

13. (a) (i) Describe the types of Loads acting on the beam.
(ii) Types of beams.

(Or)

- (b) Explain the Shear Force and Bending Moment diagram for a cantilever with point load.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science
 MATHEMATICS - II
 (2008 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part-A

(5 × 3 = 15)

Answer any **five** questions.

1. Evaluate $\int_0^1 \int_0^1 (x^2 + y^2) dx dy$.
2. Evaluate $\int_{-1}^1 \int_0^z \int_{x-z}^{x+z} (x + y + z) dx dy dz$.
3. If $\vec{F} = (5xy - 6x^2) \vec{i} + (2y - 4x) \vec{j}$, evaluate $\int_C \vec{F} \cdot d\vec{R}$ along the curve C in the xy -plane, $y = x^3$ from (1, 1) to (2, 8).
4. Prove that the vector $\vec{F} = (x^2 + y^2 + x) \vec{i} - (2xy + y) \vec{j}$ is irrotational.
5. Determine p such that given function :

$$f(z) = \frac{1}{2} \log(x^2 y^2) + i \tan^{-1} \left(\frac{px}{y} \right) \text{ be an analytic function.}$$

6. Evaluate $\int_C \frac{e^{2z} dz}{(z-1)(z-2)}$ using Cauchy's integral formula, where C is the circle $|z| = 3$.

7. Evaluate $L(e^{-3t}(\cos 2t + \sin 3t))$

8. Evaluate $L^{-1}\left(\frac{S+3}{S^2-4S+13}\right)$

Part-B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Evaluate $\int_0^3 \int_1^{4-y} (x+y) dx dy$ by changing the order of integration.

(Or)

(b) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_{\sqrt{x^2+y^2}}^1 \frac{dz dy dx}{\sqrt{x^2+y^2+z^2}}$.

10. (a) Verify Stoke's theorem for $\vec{F} = (x^2 + y^2) \vec{i} - 2xy \vec{j}$ taken around the rectangle bounded by the lines $x = \pm a, y = 0, y = 6$.

(Or)

(b) Verify divergence theorem for :

$F = (x^2 - yz) \vec{i} + (y^2 - zx) \vec{j} + (x^2 - xy) \vec{k}$ taken over the rectangular parallelepiped $0 \leq x \leq a, 0 \leq y \leq 6, 0 \leq z \leq e$

11. (a) Find analytic function $f(z) = u(r, \theta) + i v(r, \theta)$ such that $v(n\theta) r^2 \cos 2\theta - r \cos \theta + 2$

(Or)

(b) Determine the analytic function whose real part is $x \sin x \cos ny - y \cos x \sin ny$.

12. (a) Find the Laurent's expansion of $f(z) = \frac{7z-2}{(z+1)z(z-2)}$ in the region $1 < 2 + 1 < 3$.

(Or)

- (b) By integration around a Unit circle, evaluate $\int_0^{2\pi} \frac{\cos 3\theta}{5-4\cos\theta} d\theta$.

13. (a) Solve by Laplace transformation, the equation :

$$\frac{d^2x}{dt^2} - 2\frac{dx}{dt} + x = e^t \text{ with } x = 2, \frac{dx}{dt} = -1 \text{ at } t = 0.$$

(Or)

- (b) Solve $\frac{d^2x}{dt^2} + 9x = \cos 2t$ if $x(0) = 1, x(\pi/2) = -1$ by Laplace transformation.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

FLUID MECHANICS

(2008 Onwards)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Express the intensity of pressure at a point below the surface of the sea in terms of.
 - (i) metres of water absolute pressure.
 - (ii) kg/cm² gauges pressure.
 - (iii) kg/cm² absolute pressure.
2. Explain Pascal's law.
3. Explain the stability considerations for bodies in flotation.
4. Flotation the continuity equation for fluid flow.
5. Explain source, sink and doublet.

6. Give the principle and working of pitot tube.
7. Explain the concepts of Laminar and Turbulent flows.
8. Discuss the effect of pressure on boundary layer formulation.

Part - B

(5 × 12 = 60)

Answer **All** questions.

- 9.(a) (i) Give the principle and working of differential U-tube manometer.
- (ii) A differential manometer is attached to two sections A and B of a conduct carrying a liquid of sp.gr. 0.92 under pressure. The deflection of the mercury in the leg of the manometer nearer A is 50cm lower than at B. Calculate the differences in pressure in kg/cm² between A and B. sp.gr of mercury is 13.6. Express its also in equivalent head of oil.

(Or)

- (b) Give the construction and working of.
- (i) Bourdon gauge and
 - (ii) Diaphragm pressure gauge.

10. (a) Explain centre of pressure. Discuss a method of finding centre of pressure of an immersed surface

(Or)

- (b) (i) Discuss buoyancy and conditions for stability for a floating body.
- (ii) A log of wood 50cm by 50cm by 5 metres is to be used as a buoy in sea water weighing 1025kg/m^3 . The log weighs 640 kg/m^3 . What volume of concrete block should be tied to the bottom of the log if it is to float erect with one metre of it projecting above the water surface? Assume weight of concrete to be 2500 kg/m^3

11. (a) What is a flow net? Explain a method of drawing flow net. Discuss the uses and limitations of the flow nets.

(Or)

- (b) Explain the source and sink for an ideal flow of liquid. Evaluate the potential function for the doublet.

12. (a) Explain Euler's equation. Hence derive Bernoulli's equation

(Or)

(b) Give the theory and working of orifice meter.

13. (a) Discuss the types of boundary layer in a viscous flow. Explain the method of finding the shear stress in turbulent flow.

(Or)

- (b) Discuss the pressure drag friction drag. Explain drag coefficient. Discuss friction drag in turbulent boundary layer.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

THERMODYNAMICS

(2008 Onwards)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Explain Thermodynamic equilibrium.
2. State and explain law of conservation of momentum.
3. State and explain charle's law.
4. Differentiate cycle and engine.
5. Explain the terms internal energy and Enthalpy.
6. Name any three fuels with its calorific values.
7. List the advantages of Air compressos.
8. Explain the basic principle of gas turbines mention its types.

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) (i) State and explain second law of thermo dynamics.

(ii) Explain what is entropy ? Mention its uses.

(Or)

(b) (i) State and explain law of conservation of momentum.

(ii) Explain briefly about steady flow processess.

10. (a) Deduce the gas equation ? Mention its applications.

(Or)

(b) (i) Explain what is Joules law. State its uses.

(ii) Explain why C_p is grater than C_v .

11. (a) Derive the efficiency of carnot cycle.

(Or)

(b) Describe the working of otto engine with a neat diagram.

12. (a) Write a short note on :-

(i) Partial pressure.

(ii) Enthalpy.

(Or)

(b) Write an essay about combustion of fuels.

13. (a) Explain the working of multistage compression.

(Or)

(b) Describe the principle and working of Rocket propulsion with neat diagram.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

BASIC ELECTRICITY AND ELECTRONICS

(2008 Onwards)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. An alternating voltage $(8 + j6)$ v is applied to a series ac circuit and the current flowing is $(-2 + j5)$ A. find
 - (i) Impedance
 - (ii) the power consumed.
 - (iii) phase angle.

2. What are the difficulties in applying the regeneration test on two identical series motors and state how these difficulties are overcome.

3. Differentiate UJT and BJT.

4. Why does the rotor rotate.

5. Explain the leakage factor.

6. A moving-coil ammeter, a hot-wire ammeter and a resistance of $100\ \Omega$ are connected in series with a rectifying device across a sinusoidal alternating supply of 200V . If the device has a resistance of $100\ \Omega$ to the current in one direction and $500\ \Omega$ to current in opposite direction, calculate the readings of the two ammeters.

7. Distinguish current and potential transformers.

8. How half-wave rectifier works.

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Two conductors, one of copper and the other of iron are connected in parallel and at 20°C carry equal currents. What proportion of current will pass through each ? If each temperature is raised to 100°C ? Assume α for copper as 0.0042 and for iron as 0.006 per $^\circ\text{C}$ at 20°C . Find also the values of temperature coefficients at 100°C .

(Or)

(b) Explain the phase angle introduced between an alternating voltage and current when the circuit contains resistance only, inductance only and capacitance only.

10. (a) Explain how induction regulator can be used for controlling the DC voltage in a converter? List out the advantages of this method.

(Or)

(b) What are the types of single phase transformer and state the conditions necessary for successful parallel operation of single phase transformers.

11. (a) Explain the construction and working of Induction Motor with a neat sketch.

(Or)

(b) What are the two types of rotor and explain briefly.

12. (a) Explain with the aid of a neat sketch the working of a CR tube. List some of its importance uses.

(Or)

- (b) What is meant by coupling of two amplifier what are the different ways of coupling various stages of audio amplifier ? Compare the following types of couplings.

- (i) R-C Coupling
- (ii) transformer coupling as regards their frequency characteristics and over all gain.

13. (a) Discuss with neat circuit diagram the working of the bridge rectifier and analyse its characteristics.

(Or)

- (b) Write notes on :-

- (i) Voltage regulator.
- (ii) UPS.
- (iii) transformer utility factor.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

MECHANICS OF FLIGHT

(2008 Onwards)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. What is aerodynamics ?
2. What is wind Tunnel balances ? Give its type.
3. Define : Aerodynamic centre.
4. What is transition point in airflow ?
5. Give the fundamental equation for Lift and Drag.
6. Explain : Tip path plane.
7. Mention the co-ordinates of wind axis system.

8. Define : Autorotation of helicopter.

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Explain :

- (i) Humidity
- (ii) Density
- (iii) Inversion
- (iv) Angle of attack.

(Or)

(b) Explain in detail :

- (i) Reynolds number
- (ii) Application of Newton's third law and Bernoulli's principle in lift generation.

10. (a) (i) What is Wind Tunnel ?

- (ii) Explain open circuit and closed circuit wind tunnel.

(Or)

(b) Draw a neat chart for classifications of aircraft.

11. (a) Explain about heading control in helicopter.

(Or)

(b) Discuss: Collective pitch-throttle coordination in helicopter control.

12. (a) Explain shock wave and its types.

(Or)

(b) Explain the control around lateral axis.

13. (a) Explain - Longitudinal Stability of an aircraft.

(Or)

(b) Explain - Lateral stability of an aircraft.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

AIRCRAFT MATERIALS

(2008 Onwards)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Mention the alloys of copper with their chemical composition.
2. Mention any five applications of alloys of nickel.
3. What is meant by ultrasonic inspection ?
4. Define Hardening and tempering.
5. Define Anodizing and Electroplating.
6. Mention the types of woods and plywoods in Aircraft fabrics.
7. Define composite materials and Honey comb structure.

8. Define sandwich contribution.

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Explain the alloys of copper with chemical composition and properties.

(Or)

(b) Explain alloys of titanium with chemical properties.

10. (a) Explain the procedure for Izod impact test on Aircraft components in Quality control Depot.

(Or)

(b) Explain creep and fatigue test.

11. (a) Explain Eddy Current inspection Procedure.

(Or)

(b) Explain Radiography method of inspection.

12. (a) Explain the types of Corrosion and Electroplating treatment.

(Or)

(b) Explain types woods and Plywoods used in Aircraft fabrics.

13. (a) Explain the construction of honey comb structure with neat sketch.

(Or)

(b) Explain Thermosetting Plastics or Thermoplastics.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

AIRCRAFT STRUCTURES

(2008 Onwards)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. What is the significance of wing station number ?
2. Write the advantages of semi-monocoque fuselage ?
3. What are the primary control surfaces ?
4. What is the function of leading edge flaps ?
5. What are the functions of landing gear ?
6. What is the purpose of “Snubber” ?
7. Define MTOW ?

8. What is the purpose of “Sling ?

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Describe about the aircraft station numbers ?

(Or)

(b) Describe about the types of fuselages.

10. (a) Describe about the power assisted control system ?

(Or)

(b) What is flap ? Explain about its types.

11. (a) Describing about the operating principle of oleo-pneumatic strut ?

(Or)

(b) What is the purpose of steering system ? Explain about the mechanical steering system ?

12. (a) Explain the procedure of calculation of empty weight ?

(Or)

(b) Describe about the weight and balance data of particular type of aircraft ?

13. (a) Write the various equipment required for assembly and rigging ?

(Or)

(b) How will you check the Dihedral and incidence of wing surfaces ?

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

AIRCRAFT SYSTEMS

(2008 Onwards)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. What is viscosity and what is the unit for it ?
2. Define Pascal's law.
3. Explain the functioning of pneumatic check valve.
4. Name the five basic requirements for cabin pressurization and air conditioning system.
5. What is "hypoxia" and what are the effects of it on human body with increasing height ?
6. List down the methods used for control of ice formation in Aircraft.

7. What is volatility of fuel ?
8. What are the purpose of fuel vent system ?

Part - B

(5 × 12 = 60)

Answer **All** the questions.

9. (a) Enumerate the purpose of hydraulic Accumulator and describe its type with figure.

(Or)

- (b) How will you ensure the hydraulic fluid is not contaminating during Maintenance.

10. (a) Name the components of pneumatic system and explain the operation of pressure relief valve.

(Or)

- (b) Eumerate the sources of pneumatic supply and explain.

11. (a) What are the different heating system used in aircraft air conditioning system and explain gasoline combustion heater ?

(Or)

(b) List down the components of air distribution system of cabin pressurization and explain the air duct.

12. (a) What is single point fueling system and explain ?

(Or)

(b) Explain the various fuel tank construction in detail.

13. (a) With the help of schematic diagram explain the hydraulic wind screen wiper system.

(Or)

(b) Write short notes on :-

(i) Pneumatic Deicing system.

(ii) Ice prevention

(iii) Thermal Anti-icing systems.

B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

PISTON ENGINE AND PROPELLER

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions

1. List the advantages of opposed type engine.
2. What is the purpose of crankshaft. Name the parts of crank shaft.
3. Define valve lead, valve lag and valve overlap.
4. Name the different types of lubrication system and explain splash lubrication system.
5. What are the purposes of super charger ?
6. Define specific fuel consumption of Engine ?
7. Write the advantages of Dual Magneto Inspection ?

8. What is pitch distribution in case of propeller ?

Part - B

(5 × 12 = 60)

Answer **All** questions

9. (a) What are the characters of Piston Engine, Explain in detail.

(Or)

(b) Describe the operation of four stroke five event cycle of Piston Engine with PV Diagram.

10. (a) Write down the construction and function of the following :-

(i) Intake valve.

(ii) Expauast valve.

(iii) Valve guides.

(iv) Valve seat.

(Or)

(b) Draw a neat sketch and describe about simple induction system of Piston Engine.

11. (a) Explain the construction and function of oil temperature regulator, oil pressure relief valve.

(Or)

(b) Describe about various components of a fuel injection system.

12. (a) What are the various types of Magnetos and describe them in detail.

(Or)

(b) Write the function and construction of spark plug.

13. (a) Explain the construction of fixed pitch wooden propeller and metal propellers.

(Or)

(b) What is meant by propeller synchronizing and Explain it ?

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

GAS TURBINE ENGINE

(2008 Onwards)

Duration : 3 Hours

Maximum : 75 Marks

Instruction : Draw suitable diagrams if necessary.

Part - A

(5 × 3 = 15)

Answer any **Five** questions.

1. Explain the principle of jet propulsion.
2. Write short notes on can type combustion chamber.
3. List out the factors that affect the amount of thrust produced by a propeller blade.
4. Explain the different types of jet fuel.
5. Briefly explain about oil pressure relief valve.
6. Compare the functions of CD Inlet duct and CD Exhaust duct.

7. Sketch a basic starter generator circuit.
8. Write short notes on igniters used in a gas turbine engine.

Part - B (5 × 12 = 60)

Answer **All** the questions.

9. (a) Derive the thrust equation for a gas turbine engine.

(Or)

- (b) Explain:

- (i) Thrust distribution in a gas turbine engine.
- (ii) Newton's laws of motion.

10. (a) Explain the operation of centrifugal flow compressor.

(Or)

- (b) Define “thrust augmentation”. Explain about thrust augmentation devices.

11. (a) Explain the forces acting on a propeller.

(Or)

- (b) Explain the operation of turbo prop engine.

12. (a) Write short notes on :-

(i) Fuel Pump.

(ii) Fuel strainer.

(Or)

(b) Explain supervisory Electronic Engine Control (EEC) system in detail.

13. (a) Briefly describe the operation of combustion starter.

(Or)

(b) Explain high energy ignition system of a gas turbine engine.

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B.Sc. DEGREE EXAMINATION, APRIL 2010

Aeronautical Science

AIRCRAFT INSTRUMENTS

(2008 - Onwards)

Duration : 3 Hours

Maximum : 75 Marks

Part - A

(5 × 3 = 15)

Answer any **Five** questions

1. Define three principal codes used for altimeter pressure setting.
2. What do you understand by gimlock and gimbal error.
3. What is meant Aparant drift and Real drift - explain
4. Define Seebeck effect, Peltier effect and Thomson effect.
5. Explain briefly how the total fuel remaining may be indicated.
6. What is acceleration error, tuning error in magnetic liquid composes
7. Notes on :
 - (i) Hard iron magnetism.
 - (ii) Permeabilty.

8. Why capping mechanism is provided in Directional gyro.

Part - B

(5 × 12 = 60)

Answer **All** questions

9. (a) Explain the Rate of Climb indicator function during level off, decent, and climbing.

(Or)

(b) With help of diagrams describe how ball type of indicators display,

(i) A correctly banked turn.

(ii) A skid to port.

(iii) A slip to starboard.

10. (a) Explain how Machmeter measures air speed and altimeter variables in terms of Mach number.

(Or)

(b) With the aid of schematic diagram, describe construction of vertical speed indicators.

11. (a) On what fundamental principles does a Radiatin Pyrometer system operate ? Briefly describe the practical system.

(Or)

(b) Describe construction and operation of Ratiometer type of temperature indicators.

12. (a) What do you understand by “HEADUP DISPLAY”. With the aid of diagram describe how the required basic flight data is displayed to the pilot.

(Or)

(b) Describe method of grouping flight instruments and power plant instruments on the pilot’s instrument panel.

13. (a) Describe mapnet system of typical aircraft compass.

(Or)

(b) Notes on :

- (i) Demand type Oxygen Regulators.
- (ii) Oxygen masks.
- (iii) Hard iron magnetisms.
- (iv) Permeability.

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B.Sc. DEGREE EXAMINATION, APRIL 2010**Aeronautical Science****MATHEMATICS - I****(Upto 2007 Batch)**

Time : 3 Hours

Maximum : 75 Marks

Part-A

(5 × 3 = 15)

Answer any **five** questions.

1. Express $\frac{1+i}{1-i}$ in the modulus amplitude form.
2. Find all the value of $(1+i)^{1/3}$.
3. Split into partial fractions $\frac{3x-1}{(x+2)(x-1)}$.
4. Show that the science $1+r+\dots+r^n+\dots$ converges to $\frac{1}{1-r}$ in $0 < r < 1$.
5. Find the point of intersections of linear $2x+7y=25$, $7x-2y=8$.

6. Find $\frac{dy}{dx}$ if $y = e^{a \sin^{-1} x}$.

7. Show that $\int_0^1 \frac{dx}{e^x + 1} = \log\left(\frac{2e}{1+e}\right)$.

8. Form the equation if $y = a \cos x + b \sin x$.

Part-B

(5 × 12 = 60)

Answer **All** questions.

9. (a) If $x + iy = \frac{3}{2 + \cos \theta + T \sin \theta}$ prove that $x^2 + y^2 = 4x - 3$.

(Or)

(b) Expand $\sin^4 \theta \cos^2 \theta$ in a series of cosines of multiple of θ .

10. (a) Spilt into partial fractions $\frac{1}{(x^2 + 1)(x - 3)}$.

(Or)

(b) Show that :

$$1 - \frac{n+x}{1+x} + \frac{(n+2x)(n-1)}{\underline{2}(1+x)^2} - \dots = 0.$$

11. (a) Find the equations of the line which passes through the point of intersection of the lines $2x + y = 8$ and $3x - 2y + 7 = 0$ and is parallel to the line $4x + y - 11 = 0$.

(Or)

- (b) Show that the circles $x^2 + y^2 + 2x - 8y + 8 = 0$ and $x^2 + y^2 + 10x - 2y + 22 = 0$ touch each other externally. Find their point contact. Also find the equation of the common tangent.

12. (a)(i) If $y = e^{a \sin^{-1} x}$ prove $(1 - x^2) y_2 - x y_1 - a^2 y = 0$.

- (ii) Find the length of tangent, normal, subtangent and subnormal to the curve $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$ at $\theta = \frac{\pi}{2}$.

(Or)

- (b) Evaluate $I = \int_{\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\sin^2 x}{\sin x + \cos x} dx$

13. (a) Solve $\frac{dy}{dx} = \frac{x - y + 1}{x + y - 3}$

(Or)

- (b) Solve $(D^2 + D + 1)y = \sin 2x$.

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