TECHNICAL BRANCH

ENGINEERING KNOWLEDGE TEST (EKT)

DISCLAIMER

The model question paper only offers a broad overview and does not purport to represent either the syllabus or the pattern of questions that would appear in the Engineering Knowledge Test

SCHEME AND SYLLABUS

Engineering Knowledge Test is a common test aimed at testing the Basic Engineering knowledge of the candidates applied for Aeronautical Engineering Courses. EKT has two parts, namely

Part A - General Engineering: 40 Questions
Part B - Specialist Paper for each Engineering discipline: 35 Questions
} Duration: 1 Hour

Engineering Knowledge Test is pitched at pre-final to final year engineering level. The test consists of two parts viz General Engineering and Specialist subjects for the two streams of Technical Branches i.e Aeronautical Engineering (Electronics) and Aeronautical Engineering (Mechanical).

The specialised papers are in Mechanical Engineering, Aeronautical engineering, Electronics and Communication engineering, Electrical and Instrumentation engineering and Computer Engineering.

The questions are objective type in nature and duration of test is approximately one hour. It is mandatory for the candidates to pass in both General and Specialist papers to qualify for AFSB interview.

MODEL QUESTION PAPER

ENGINEERING KNOWLEDGE TEST (EKT)

Part A: General Engineering

1. The probability of hitting a target from one gun 9/10, from another gun is 7/10. If both gun are fired at the same time, the probability of hitting the target is
(A) 2/20 (B) 63/100
(C) 16/20 (D) 63/20

2. If the three vectors a, b and c are coplanar , then the missed product a x b. c is
(A) Zero (B) Non-Zero
(C) Unity (D) Non of these

3. Limit $\underset{x\to 0}{\lim} \frac{\sin x}{x}$ is
(A) not defined (B) 1
(c) zero (D) -1

4. The Laplace transform of $\sin^2 3t$ is
(A) $\frac{18}{S(S^2+36)}$ (B) $\frac{18}{S^2(S+36)}$
(C) $\frac{18}{(S+36)}$ (B) $\frac{18}{(S+36)(S+4)}$

5. The function
$$f(x) \begin{cases} x^2 & \text{for } x \leq 3 \\ 2x+3 & \text{for } x>3 \end{cases}$$
(A) continuous over the entire number scale
(B) continuous at x=3 but discontinuous at all other points
(C) discontinuous at x=3 but continuous at all other points
(D) discontinuous everywhere

6. When a body hits an obstacle, the force with which it hits the obstacle depends upon its
(A) average velocity
(B) velocity at the instant of collision
(C) initial velocity
(D) all of these

7. The wavelength of visible light is of the order of
(A) 1µm (B) 100 µm
(C) 1mm (D) 1 Å

8. Whenever a source of sound moves towards an observer
(A) the frequency heard by the observer is less than that of the source
(B) the frequency heard by the observer is greater than that of the source
(C) the frequency heard by the observer is unchanged
(D) the wavelength of sound heard is greater than that of the sound emitted

9. Moving electric charges will interact with
(A) electric field only
(B) magnetic field only
(C) both of these
(D) none of these

10. Gamma radiation is most similar to
(A) sound waves (B) X-ray
(C) Alpha particles (D) neutrons

11. The fundamental particle responsible for keeping the nucleus together is
(A) meson (B) anti proton
(C) positron (D) muon

12. Air contains 21% oxygen by volume and the rest nitrogen. If the barometer pressure is 740 mm of Hg the partial pressure of oxygen is close to
(A) 155 mm of Hg
(B) 310 mm of Hg
(C) 465 mm of Hg
(D) 162 mm of Hg

13. In the electrolytic cell
(A) electrical energy is converted into chemical energy
(B) chemical energy is converted into electrical energy
(C) mechanical energy is converted into potential energy
(D) potential energy is converted into kinetic energy

14. The force required to maintain a body at constant speed in free space is equal to
(A) the mass of the body
(B) zero
(C) the weight of the body
(D) the force required to stop it

15. If the length of a spring is halved, the spring constant becomes
(A) half (B) $1/4^{th}$
(C) double (D) four times

16. The coefficient of static friction depends on
(A) the material of the bodies in contact
(B) the quality of surface finish of the bodies
(C) the presence of foreign matter between the surface
(D) all of these

17. The units of angular impulse in SI system are
(A) Nms (B) Ns
(C) Nm/s (D) Ns/m

18. A particle is projected with a velocity $\sqrt{\frac{4gR}{3}}$
(A) $\left(\frac{gR}{2}\right)^{1/2}$ (B) $\left(\frac{gR}{3}\right)^{1/2}$
(C) $(gR)^{1/2}$ (D) $\left(\frac{2gR}{3}\right)^{1/2}$

19. Stainless steel contains iron and
(A) Chromium and nickel
(B) Chromium and carbon
(C) Nickel and carbon
(D) Chromium and manganese

20. The property of material by which it offers resistance to scratching or indentation is called
(A) Brittleness
(B) Hardness
(C) Toughness
(D) Resilience

21. The failure of a material due to repeated stressing is known as
(A) Creep
(B) Fracture
(C) Fatigue
(D) Brittle Fracture

22. The electric device which blocks DC but allows AC is called
(A) Capacitor
(B) Inductor
(C) Amplifier
(D) Transducer

23. When a charge is moved from one point to another in an electric field, the work done is
(A) independent of the path
(B) zero along the direction of the field
(C) measured in Joules per metre
(D) measure in Volt per metre

24. A capacitor with lowest leakage is
(A) Paper (B) Ceramic
(C) Polyester (D) Mica

25. A zener diode operates
(A) In an extremely high forward bias
(B) In an extremely low reverse bias
(C) In an extremely low forward bias
(D) In a reverse bias higher than laid down voltage

26. The specific gravity of a lead acid cell is often used as a measure of its
(A) Rate of discharge
(B) Operating temperature
(C) State of charge
(D) Life expectancy

27. An uniformly distributed load is one which
(A) Acts at a point on a beam
(B) Spreads uniformly over the whole length of a beam
(C) Varies uniformly over the whole length of a beam
(D) loads the beam from one end only

28. A steam engine device which keeps the speed of the engine, all loads, constant is known as
(A) Flywheel
(B) Eccentric
(C) Connecting rod
(D) Governor

29. The refrigerant hiving the lowest freezing point is
(A) Ammonia
(B) Carbon dioxide
(C) Freon – 11
(D) Freon – 22

30. Heat and work are
(A) Path functions
(B) Properties of a substance
(C) Point functions
(D) Absolute units

PART B-1 AE (M): MECHANICAL ENGINEERING

1. An impulse turbine
(A) Makes use of a draft tube
(B) Always operates submerged
(C) Converts the pressure head into velocity head through the vanes
(D) Is most suited for low head installations

2. Power required to drive a centrifugal pump is directly proportional to
(A) Diameter of its impeller
(B) Square of diameter of its impeller
(C) Cube of diameter of its impeller
(D) Fourth power of diameter of its impeller

3. The locus of the common point on the two meshing spur gears is known as
(A) Addendum circle
(B) Duodenum circle
(C) Pitch circle
(D) Base circle

4. When there is a reduction in amplitude over every cycle of vibration then the body is said to have
(A) Free vibration
(B) Forced vibration
(C) Damped vibration
(D) Natural vibration

5. For machining at high speed the tool material should have
(A) Wear resistance
(B) Red hardness
(C) Toughness
(D) All of these

6. MIG welding is
(A) A gas welding process
(B) An electric resistance welding process
(C) A electric resistance welding process
(D) A forge welding process involving high temperatures and low pressures

7. The ability of sand to permit the metal to shrink when it solidifies is known is
(A) Plasticity (B) Permeability
(C) Collapsibility (D) Cohesiveness

8. Rivets are generally specified by
(A) Overall length
(B) Shank diameter
(C) Thickness of plates to be jointed
(D) Diameter of head

9. Which of the following is steady flow compressor
(A) Reciprocating compressor
(B) Centrifugal compressor
(C) Voot blower
(D) Vane blower

10. A closed cycle gas turbine works on
(A) Carnot cycle (B) Rankine cycle
(C) Brayton cycle (D) Joule cycle

11. Thermal conductivity of solid metals
(A) Decreases with rise in temperature
(B) Does not vary with temperature
(C) Increases with rise in temperature
(D) Remains constant with rise in temperature

12. During adiabatic saturation process, air property which remains constant, is known as
(A) Wet bulb temperature
(B) Dry bulb temperature
(C) Relative humidity
(D) Specific humidity

13. Bell-Coleman cycle as applied to refrigeration operates
(A) On open air system
(B) On vapour compression system
(C) On vapour absorption system
(D) On none of these

14. The gears in which axes of the shaft connected by them, intersect, are known as
(A) Spur gears (B) Bevel gears
(C) Spiral gears (D) Gear train

15. Shot peening
(A) Is done at re-crystallization temperature
(B) Changes the crystalline structure at materials
(C) Improves the fatigue life of small parts
(D) Refines the grain structure

16. In a bomb calorimeter the heat released by the fuel is absorbed by
(A) Atmospheric air
(B) Water
(C) Metal container
(D) Bomb, water and metal container

17. Nitriding is done
(A) On low carbon steels only
(B) To impart blue colour to steels
(C) To improve machinability
(D) To increase surface hardness

18. The extent of cold work that a metal can withstand depends on
(A) Purity of metal
(B) Carbon percentage
(C) Ductility
(D) Room temperature

19. Which engine has the highest air fuel ratio
(A) Petrol engine (B) Gas engine
(C) Diesel engine (D) Gas turbine

20. Annealing of steels is done to
(A) Remove internal stresses
(B) Produce soft core under hard surface
(C) Produce hard core under soft surface
(D) Introduce capacity to withstand shocks

PART B-2 AE (M): AERONAUTICAL ENGINEERING

1. What mass of lead (sp gr = 11) will weigh as much as 8 gram of iron (Sp gr = 8) when both are immersed in water
(A) 7.7 gram (B) 8.8 gram
(C) 10.0 gram (D) 1.1 gram

2. Which of the two forces are important in floating bodies
(A) inertial, pressure
(B) buoyancy, gravity
(C) gravity, inertial
(D) pressure, viscous

3. A dimensionless number which is a ratio of kinematics viscosity to thermal diffusivity is known as
(A) Prandtl Number
(B) Nusselt Number
(C) Reynold's Number
(D) Stanton Number

4. Ozone is an
(A) isomer of oxygen
(B) allotrope of oxygen
(C) isobar of oxygen
(D) isotope of oxygen

5. Within a carburetor the velocity of air is maximum at
(A) inlet
(B) outlet
(C) venture
(D) does not change within a carburetor

6. A 50 Kg mass is accelerated from rest to 50 m/s. The force on it is
(A) 500 N
(B) 2,500 N
(C) 512 N
(D) Can not be determined from the given data

7. In vacuum the velocity of light depends on
(A) none of the following
(B) frequency
(C) temperature
(D) pressure

8. The source of solar energy is
(A) nuclear fission / fusion
(B) electromagnetic radiation
(C) chemical energy
(D) burning of hydrogen

9. The pressure of a real gas is less than the pressure of an ideal gas because of
(A) increase in the number of intermolecular collisions
(B) higher energy possessed by the molecules than the theoretical estimates
(C) inter-molecular forces
(D) finite size of molecules

10. Which of the following is dimensionless
(A) young's modulus of elasticity
(B) stress (C) strain
(D) shear stress

11. Which of the following relations is incorrect
One atmospheric pressure is nearly equal to
(A) 1013 bar
(B) 1013250 dynes/cm^2
(C) 1.033kgf/cm^2
(D) 735 mm of Hg

12. Which of the following is a scalar quantity
(A) velocity of a gear
(B) acceleration of a car
(C) force in friction
(D) area of a triangle

13. The Mach number at inlet of a gas turbine diffuser is 0.3. The shape of the diffuser would be
(A) converging (B) diverging
(C) diverging – converging
(D) converging – diverging

14. For adiabatic expansion with friction through a nozzle, the following remains constant
(A) entropy (B) static enthalpy
(C) stagnation enthalpy
(D) stagnation pressure

15. Separation of flow is caused by
(A) reduction of pressure in the direction flow
(B) decrease in the boundary layer thickness
(C) increase of pressure in the direction of flow
(D) adverse pressure gradient

16. A pilot tube senses
(A) stagnation pressure
(B) average pressure
(C) maximum pressure
(D) velocity head pressure

17. Which of the following materials has the higher value of Poisson' ratio
(A) rubber (B) copper
(C) steel (D) concrete

18. During forced vertex flow
(A) velocity increases with radius
(B) velocity decreases with radius
(C) fluid rotates as a composite solid
(D) inertial forces are significant

19. Hooke's law is valid within the limits of proportionality. The limit of proportionality depends on
(A) type of loading
(B) area of cross section
(C) type of material
(D) hardness of material

20. Euler's equation of fluid motion can be integrated when it is assumed that
(A) the fluid is incompressible
(B) Bernoulli's equation is satisfied
(C) flow is rotational
(D) velocity potential exits and the density is constant

PART B-3 AE (L): ELECTRICAL, ELECTRONICS AND INSTRUMENTATION

1. In order for a 30 volt, 90 watt lamp to work properly in a 120 volt supply the required series resister in ohm is
(A) 10 (B) 20
(C) 30 (D) 40

2. According to Theremin's theorem, any linear active network can be replaced by a single voltage source
(A) in series with a single impedance
(B) in parallel with a single impedance
(C) in series with two impedances
(D) in parallel with two impedances

3. The internal resistance of ammeter is
(A) very small (B) very high
(C) infinite (D) zero

4. Hay bridge is used mainly for the measurement of
(A) resistance (B) inductance
(C) conductance (D) capacitance

5. Which of the following is true about series resonance
(A) The reactance becomes zero and impedance becomes equal to resistance
(B) The current in the circuit becomes maximum
(C) The voltage drop across inductance and capacitance cancels each other
(D) All of the above statements are correct

6. A 3-Φ, 4 wire, 400/230 v feeder supplies 3-phase motor and an unbalanced lighting load. In this system
(A) all four wires will carry equal current
(B) neutral wire will carry no current
(C) neutral wire will carry both motor current and lighting load current
(D) neutral wire will carry current only when lighting load is switched on

7. Equalizing connections are required when paralleling two
(A) alternators
(B) compound generators
(C) series generators
(D) both (B) and (C)

8. An ideal transformer is one which
(A) has a common core for its primary and secondary windings
(B) has no losses and magnetic leakage
(C) has core of stainless steel and windings of pure copper metal
(D) has interleaved primary and secondary windings

9. The principle of operation of a 3-phase induction motor is most similar to that of a
(A) synchronous motor
(B) repulsion-start induction motor
(C) transformer with a shorted secondary
(D) capacitor-start, induction-run motor

10. In the forward region of its characteristic, a diode appears as
(A) an OFF switch
(B) a high resistance
(C) a capacitor
(D) an ON switch

11. The common-emitter forward amplification factor βdc is given by
(A) I_C/I_E (B) I_C/I_b
(C) I_E/I_C (D) I_B/I_F

12. A common emitter amplifier is characterized by
(A) low voltage gain
(B) moderate power gain
(C) signal phase reversal
(D) very high output impedance

13. After V_{DS} reaches pinch-off value V_P in a JFET, drain current I_O becomes
(A) zero (B) low
(C) saturated (D) reversed

14. An electronic oscillator
(A) needs an external input
(B) provides its own input
(C) is nothing but an amplifier
(D) is just a dc/ac converter

15. In an SCR, the function of the gate is to
(A) switch it off
(B) control its firing
(C) make it unidirectional
(D) reduce forward breakdown voltage

16. NAND and NOR gates are called 'universal' gates primarily because they
(A) are available everywhere
(B) are widely used in IC packages
(C) can be combined to produce AND, OR and NOT gates
(D) are the easiest to manufacture

17. Registers and counters are similar in the sense that they both
(A) count pulses
(B) store binary information
(C) are made from an array of flip-flops and gates integrated on a single chip
(D) are in fact shift register

18. A flip-flop
(A) is a sequential logic device
(B) is a combinational logic device
(C) remembers what was previously stored in it
(D) both (A) and (C)

19. An operational amplifier
(A) can be used to sum two or more signals
(B) can be used to subtract two or more signals
(C) uses to principle of feed back
(D) all of the above

20. TTL logic is preferred to DRL logic because
(A) greater fan-out is possible
(B) greater logic levels are possible
(C) greater fan-in is possible
(D) less power consumption is possible

PART B-4 AE (L): ELECTRONICS AND COMMUNICATIONS

1. In a communication system, noise is most likely to get into the system
(A) at the transmitter
(B) in the channel
(C) in the information source
(D) at the destination

2. When modulation frequency is doubled, the modulation index is halved, and the modulating voltage remains constant, the modulation system is
(A) amplitude modulation
(B) phase modulation
(C) frequency modulation
(D) angle modulation

3. Impedance inversion may be obtained with
(A) a short – circuited stub
(B) an open – circuited stub
(C) a quarter – wave line
(D) a half – wave line

4. HIGH frequency waves are
(A) observed by the F_2 layer
(B) reflected by D layer
(C) capable of use for long-distance communication on the moon
(D) affected by the solar cycle

5. Which one of the following terms does not apply to the Yagi-uda array
(A) Good band width
(B) Parasitic elements
(C) Folded diploe
(D) High gain

6. A duplexer is used
(A) to couple two different antennae to a transmitter without mutual interference
(B) to allow one antenna to be used for reception or transmission without mutual interference
(C) to prevent interference between two antennae when they are connected to receiver
(D) to increase the speed of the pulses in pulsed radar

7. Indicate which of the following system is digital
(A) Pulse – Position modulation
(B) Pulse – Code modulation
(C) Pulse – Width modulation
(D) Pulse – Frequency modulation

8. A forward error correcting code corrects errors only
(A) requiring partial retransmission of the signal
(B) requiring retransmission of entire signal
(C) using parity to correct to errors in all cases
(D) requiring no part of the signal to be transmitted

9. A typical signal strength received from a geosynchronous communication satellite is of the order of
(A) a few milli watts
(B) kilo watts (C) watts
(D) few pico watts

10. Telephone traffic is measured
(A) with echo cancellers
(B) by the relative congestion
(C) in terms of the grade of service
(D) in erlangs

11. Positive logic in a logic circuit is one in which
(A) logic 0 and 1 are represented by 0 and positive voltage respectively
(B) logic 0 and 1 are represented by negative and positive voltages respectively
(C) logic 0 voltage level in higher than logic 1 voltage level
(D) logic 0 voltage level is lower than logic 1 voltage level

12. A half-adder can be made from
(A) two NAND gates
(B) a NOT gate and an OR gate
(C) an AND gate and an OR gate
(D) an AND gate and an X-OR gate

13. Which of the following devices has its characteristics very close to that of an ideal current source.
(A) Field effect transistor
(B) Transistor in common bas mode
(C) Zener diode
(D) MOSFET

14. The main use of a common base transistor amplifier is
(A) as voltage amplifier
(B) current amplifier
(C) for matching a high source impedance to a low load impedance
(D) for rectification of a.c. signal

15. A class-B amplifier is biased
(A) Just at cut-off
(B) nearly twice cut-off
(C) at mid point of load line
(D) so that I_B equals jut I_C

16. If the peak transmitted power in a radar system is increased by a factor of 16, the maximum range will be increased by a factor of
(A) 2 (B) 4 (C) 8 (D) 16

17. A high PRF will (indicate the false statement)
(A) make the returned echoes easier to distinguish from noise
(B) make target tracking easier with conical scanning
(C) increase the maximum range
(D) have no effect of the range resolution

18. A solution to the “blind speed” problem in a radar system is to
(A) change the Doppler frequency
(B) vary the PRF
(C) use mono pulse
(D) use MTI

19. The number of active picture elements in a television image depends on
(A) fly back time
(B) CRT screen size
(C) received band width
(D) FB ratio of receiver antenna

20. In a colour TV, the three primary colours are
(A) red, orange and blue
(B) red, blue and green
(C) red, green and yellow
(D) red, orange and green

PART B-5 AE (L): COMPUTER ENGINEERING

1. A logic gate is an electronic circuit which
(A) makes logic decision
(B) allows electron flow only in one direction
(C) works on binary algebra
(D) alternates between 0 and 1 values

2. NAND and NOR gates are called 'universal' gates primarily because they
(A) are available everywhere
(B) are widely used in IC packages
(C) can be combined to produce AND, OR and NOT gates
(D) are the easiest to manufacture

3. The ascending order of a data hierarchy is:
(A) bit-byte-record-field-file-data base
(B) byte-bit-field-record-file
(C) byte-bit-record-field-file-data base
(D) bit-byte-field-record -file-data base

4. A dumb terminal can do nothing more than communicate data to and from a CPU of a computer. How does a 'smart' terminal differ from dumb terminal
(A) it has a primary memory
(B) it has a cache memory
(C) it has a micro processor
(D) it has an input device

5. The main distinguishing features of fifth generation digital computer will be
(A) liberal use of micro processors
(B) artificial intelligence
(C) extremely low cost
(D) versatility

6. Which of the following terms is not used to refer to the recording density of a disk
(A) mega-density (B) single-density
(C) double-density (D) quad-density

7. The two kinds of main memory are
(A) primary and secondary
(B) random and sequential
(C) ROM and RAM
(D) central and peripheral

8. Which one of the following is not an octal number
(A) 29 (B) 75 (C) 16 (D) 102

9. Main problem with LCDs is that they are very difficult to read
(A) directly
(B) in bright light
(C) in dull light
(D) both (B) and (C)

10. Both computer instructions and memory addresses are represented by
(A) character codes
(B) binary codes
(C) binary word
(D) parity bit

11. A computer program that converts an entire program into machine language at one time is called a/an
(A) interpreter (B) simulator
(C) compiler (D) commander

12. All the keys on the IBM PC key board repeat as long as we hold them down. Such type of keys are known as
(A) typematic keys
(B) functional keys
(C) automatic keys
(D) alphabetic keys

13. What does the acronym ISDN stands for
(A) Indian Standard Digital Network
(B) Integrated Services Digital Network
(C) Intelligent Service Digital Network
(D) Integrated Services Data Network

14. Two basic types of operating system are
(A) sequential and direct
(B) batch and time sharing
(C) direct and interactive
(D) batch and interactive

15. Which of the following entity does not belong to word processing
(A) characters (B) words
(C) cells (D) paragraphs

16. A schema describes
(A) data elements
(B) records and filer
(C) record relationship
(D) all of the above

17. Which of the following is not a tool used to manage and control schedule performance
(A) CAD (B) PERT
(C) CPM (D) Gantt Chart

18. An expert system differs from a data base program in that only an expert system
(A) contains declarative knowledge
(B) contains procedural knowledge
(C) features the retrieval of stored information
(D) experts users to draw own conclusion

19. The virtual memory addressing capability of 80386 is
(A) 4 GB (B) 16 GB
(C) 64 GB (D) 64 TB

20. The 80486 microprocessor from Intel consists of
(A) a fast 32 bit CPU but no coprocessor
(B) a 32 bit CPU and an 80387 coprocessor only
(C) a 32 bit CPU, a 80387 coprocessor and memory management unit (MMU) only
(D) a 32 bit CPU, a 80387 coprocessor, memory management unit and a cache memory