

CII – iPATE 2.0 (2021)

Computer Based PAN India Examination

Category: GRADUATE ENGINEER (ENTRY LEVEL)

Engineering Discipline: AEROSPACE ENGINEERING

Questions & Answers

(Reviewed, Revised & Published dtd. 26.11.2021)

Paper Structure

| Question Nos. | Sections & Topics | | Marks |
|---------------|--|---|------------|
| 1 to 20 | Section I : Cognitive Abilities | <ul style="list-style-type: none">Quantitative AptitudeAnalytical ReasoningData InterpretationEnglish Communication | 20 |
| 21 to 40 | Section II : Professional Abilities | <ul style="list-style-type: none">Project ManagementHealth, Safety & Risk ManagementEnvironmental LawsSocial Responsibility & EthicsFinance & AccountsLegal, Contracts & Arbitration | 20 |
| 41 to 50 | Section III (A) : Technical Abilities | Physics & Chemistry (10+2 level) | 10 |
| 51 to 100 | Section III (B) : Technical Abilities | Engineering Discipline | 50 |
| TOTAL | | | 100 |

NOTE:

- Exam Duration: 3 Hours
- Total 100 no. of Questions of 1 Mark each with Negative Marking of ½ Mark for every wrong answer
- Questions (Section wise) and respective Answer Options shuffled at Candidates' terminal

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|----------------|---|----------|----------|----------|
| Question No. 1 | Discriminant of a second-degree polynomial with integer coefficients cannot be: | | | |
| Answer Options | A) 43 | B) 33 | C) 68 | D) 25 |
| Right Answer | A | | | |

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|----------------|--|-----------|-----------|-----------|
| Question No. 2 | How many subsets A of {1, 2, 3, 4, 5, 6, 7, 8, 9, and 10} have the property that no two elements of A sum to 11? | | | |
| Answer Options | A) 1024 | B) 512 | C) 343 | D) 243 |
| Right Answer | C | | | |

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| Question No. 3 | Viru and Aarti started a car journey from Chandigarh to Delhi, which are 288 km apart. Viru took 12 hours more than Aarti to complete the journey. Had Viru travelled at double his actual speed, he would have taken 4 hours less than Aarti to complete the journey. Find the respective speeds (in km/hr) at which Viru and Aarti travelled. | | | |
| Answer Options | A) 14.4 and 9 | B) 14.5 and 28.5 | C) 9 and 14.4 | D) 15 and 20 |
| Right Answer | C | | | |

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| Question No. 4 | The height of a trapezoid whose diagonals are mutually perpendicular is equal to 4. Find the area of the trapezoid if it is known that the length of one of its diagonals is equal to 5. | | | |
| Answer Options | A) 50/3 square units | B) 100/3 square units | C) 16/6 square units | D) None of these |
| Right Answer | A | | | |

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|----------------|---|-------------|-------------|-------------|
| Question No. 5 | A polyhedron has faces that are all either triangles or squares. No two square-faces share an edge, and no two triangular-faces share an edge. What is the ratio of triangular-faces to the number of square-faces? | | | |
| Answer Options | A) 03:04 | B) 04:03 | C) 01:02 | D) 04:05 |
| Right Answer | B | | | |

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| Question No. 6 | Your mind likes reading and it actually has a number of important health affects you can't get in any other way. Reading gives you a unique "pause button" for comprehension. Typically, when you read, you have more time to think. When you watch a film or listen to a tape, you don't press that pause button. Reading requires a great deal of concentration, which calls your intelligence to action. The author of this passage would agree that: | | | |
| Answer Options | A) Reading is a good way to relax, since it doesn't require that much thinking. | B) Watching a movie has the same effect on the intelligence as reading. | C) Reading develops your intelligence. | D) Both A and C |
| Right Answer | C | | | |

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| Question No. 7 | Read the following information carefully and answer the question given below. P stands 5m west of R. T stands 5m south of Q. T stands 6m east of U. V stands 2m west of Q. A stands 2m south of U. V stands 3m north of R. If G stands 7m east of P, then in which direction does G stand with respect to T? | | | |
| Answer Options | A) West | B) East | C) South | D) North |
| Right Answer | D | | | |

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| Question No. 8 | The French Revolution began in 1789 and ended in the late 1790s with the ascent of Napoleon Bonaparte. During this period, French citizens razed and redesigned their country's political landscape, uprooting centuries-old institutions such as absolute monarchy and the feudal system. Like the American Revolution before it, the French Revolution was influenced by Enlightenment ideals, particularly the concepts of popular sovereignty and inalienable rights. From this passage it can be concluded that: | | | |
| Answer Options | A) The French revolution began before the Russian Revolution. | B) In the French Revolution their monarch was killed. | C) The American Revolution happened before the French Revolution. | D) Napoleon initiated the French Revolution. |
| Right Answer | C | | | |

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| Question No. 9 | A, B, C, D and E are sitting on a bench. A is sitting next to B, C is sitting next to D, D is not sitting with E who is on the left end of the bench. C is on the second position from the right. A is to the right of B and E. A and C are sitting together. In which position A is sitting? | | | |
| Answer Options | A) Between B and C | B) Between E and D | C) Between B and D | D) Between C and E |
| Right Answer | A | | | |

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| Question No. 10 | A, P, R, X, S and Z are sitting in a row. S and Z are in the centre. A and P are at the ends. R is sitting to the left of A. Who is to the right of P? | | | |
| Answer Options | A) X | B) Z | C) S | D) A |
| Right Answer | A | | | |

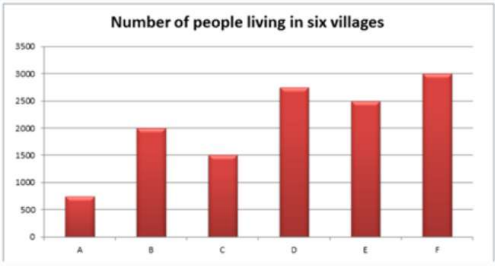
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| Question No. 11 | In the following question choose the word which is the exact OPPOSITE of the given word. STRINGENT | | | |
| Answer Options | A) Magnanimous | B) Vehement | C) General | D) Lenient |
| Right Answer | D | | | |

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|-----------------|--|-----------------------------------|-----------------------------|--|
| Question No. 12 | Some proverbs/idioms are given below together with their meanings. Choose the correct meaning of proverb/idiom. To catch a tartar | | | |
| Answer Options | A) To trap wanted criminal with great difficulty | B) To catch a dangerous person | C) To meet with disaster | D) To deal with a person who is more than one's match |
| Right Answer | D | | | |

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|-----------------|--|--------------------|-------------------|--------------------|
| Question No. 13 | Which of the phrases A), B), C) and D) given below each sentence should replace the word/phrase printed in bold in the sentence to make it grammatically correct? If the sentence is correct as it is given and no correction is required, mark (E) as the answer. Since the girl did not want to be disturbed while studying, she left the phone off hooks. | | | |
| Answer Options | A) of hook | B) for the hook | C) off hooking | D) off the hook |
| Right Answer | D | | | |

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| Question No. 14 | In the following question choose the word which is the exact OPPOSITE of the given word. FICKLE | | | |
| Answer Options | A) Courageous | B) Sincere | C) Steadfast | D) Humble |
| Right Answer | C | | | |

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| Question No. 15 | <p>In question below, the passage consists of six sentences. The first and sixth sentence are given in the correct places. The middle four sentences in each have been removed and jumbled up. These are labelled as P, Q, R and S. Find out the proper order for the four sentences.</p> <p>S1: In the middle of one side of the square sits the Chairman of the committee, the most important person in the room.</p> <p>P: For a committee is not just a mere collection of individuals.</p> <p>Q: On him rests much of the responsibility for the success or failure of the committee.</p> <p>R: While this is happening, we have an opportunity to get the 'feel' of this committee.</p> <p>S: As the meeting opens, he runs briskly through a number of formalities.</p> <p>S6: From the moment its members meet, it begins to have a sort nebulous life of its own.</p> <p>The Proper sequence should be:</p> | | | |
| Answer Options | A) RSQP | B) QSRP | C) SQPR | D) PQRS |
| Right Answer | B | | | |

| Question No. 16 | <p>Question nos. 16 to 20: Following bar chart represents the number of people in 6 different villages (A, B, C, D, E and F) and the tabular column depicts the ratio of literate to illiterate people and percentage of male living in those villages.</p>  <table border="1"> <thead> <tr> <th>Villages</th> <th>Literate : Illiterate</th> <th>% of male</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>2 : 3</td> <td>52</td> </tr> <tr> <td>B</td> <td>11 : 9</td> <td>65</td> </tr> <tr> <td>C</td> <td>13 : 2</td> <td>45</td> </tr> <tr> <td>D</td> <td>4 : 1</td> <td>70</td> </tr> <tr> <td>E</td> <td>1 : 3</td> <td>39</td> </tr> <tr> <td>F</td> <td>11 : 19</td> <td>75</td> </tr> </tbody> </table> <p>If 40% of the female from village B is literate, then what is the percentage of male, who is illiterate from village B?</p> | | | | Villages | Literate : Illiterate | % of male | A | 2 : 3 | 52 | B | 11 : 9 | 65 | C | 13 : 2 | 45 | D | 4 : 1 | 70 | E | 1 : 3 | 39 | F | 11 : 19 | 75 |
|-----------------|--|-----------|-----------|----------------------------|----------|-----------------------|-----------|---|-------|----|---|--------|----|---|--------|----|---|-------|----|---|-------|----|---|---------|----|
| Villages | Literate : Illiterate | % of male | | | | | | | | | | | | | | | | | | | | | | | |
| A | 2 : 3 | 52 | | | | | | | | | | | | | | | | | | | | | | | |
| B | 11 : 9 | 65 | | | | | | | | | | | | | | | | | | | | | | | |
| C | 13 : 2 | 45 | | | | | | | | | | | | | | | | | | | | | | | |
| D | 4 : 1 | 70 | | | | | | | | | | | | | | | | | | | | | | | |
| E | 1 : 3 | 39 | | | | | | | | | | | | | | | | | | | | | | | |
| F | 11 : 19 | 75 | | | | | | | | | | | | | | | | | | | | | | | |
| Answer Options | A) 38% | B) 35% | C) 37% | D) cannot be determined | | | | | | | | | | | | | | | | | | | | | |
| Right Answer | C | | | | | | | | | | | | | | | | | | | | | | | | |

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| Question No. 17 | What is the percentage of literate people in all the six villages together? | | | |
| Answer Options | A) 55% | B) 53% | C) 51% | D) cannot be determined |
| Right Answer | B | | | |

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|-----------------|--|---------------|---------------|---------------|
| Question No. 18 | What is the ratio between numbers of illiterate people from villages B, C & D to number of females from villages A, E & F? | | | |
| Answer Options | A) 320:527 | B) 527:330 | C) 330:527 | D) 527:320 |
| Right Answer | C | | | |

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|-----------------|--|------------|------------|----------------------------|
| Question No. 19 | If 3% of female from village D & 5% of female from village E are literate then what is the total number of literate males from D & F together? | | | |
| Answer Options | A) 1823 | B) 1723 | C) 1623 | D) cannot be determined |
| Right Answer | D | | | |

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| Question No. 20 | The number of females from villages A & C is how much percentage more or less than number of females from villages D & F? | | | |
| Answer Options | A) 25.72% | B) 25.76% | C) 24.76% | D) 24.72% |
| Right Answer | C | | | |

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| Question No. 21 | A project plan results in a project schedule seems to be too long. If the project network diagram cannot change but extra personnel resources is available, what is the best thing to do? | | | |
| Answer Options | A) | B) | C) | D) |
| | Fast track the project | Level the resources | Crash the project | Any other option |
| Right Answer | C | | | |

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| Question No. 22 | Which of the following is not Project Management's goal | | | |
| Answer Options | A) | B) | C) | D) |
| | Keeping overall cost within the budget | Delivering the project/goods to the client at agreed time | Maintaining a satisfactory and well-functioning development | Avoiding customer/client complaints |
| Right Answer | D | | | |

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| Question No. 23 | You have recently been named as Project Manager of a new project under a Contract. The Project Management Unit (PMU) gave you the contract signed by the Customer and a Statement of Work and asked you to go on with initiation. Which document should you develop next? | | | |
| Answer Options | A) | B) | C) | D) |
| | Project Manager Plan | Milestone Schedule | Project Charter | Scope Statement |
| Right Answer | C | | | |

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| Question No. 24 | The analysis tool for a quality problem that involves selecting the problem, identifying major categories of potential causes and associating likely specific causes is | | | |
| Answer Options | A) | B) | C) | D) |
| | Pareto chart | Fishbone diagram | Scatter diagram | Check list |
| Right Answer | B | | | |

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|-----------------|---|--------|--------|-------|
| Question No. 25 | The Occupational Safety & Health Administration requires employers to have Hearing Conservation Plans if the average 8-hour noise exposure is more than | | | |
| Answer Options | A) | B) | C) | D) |
| | 1000 dB | 500 dB | 105 dB | 85 dB |
| Right Answer | D | | | |

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|-----------------|--|--------|---------|----------|
| Question No. 26 | Ammonia becomes an immediate danger to your life and health when it is present at the following level or greater | | | |
| Answer Options | A) | B) | C) | D) |
| | 10 ppm | 30 ppm | 300 ppm | 1000 ppm |
| Right Answer | C | | | |

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| Question No. 27 | Exposure to high levels of noise can lead to which of the following: | | | |
| Answer Options | A) | B) | C) | D) |
| | High blood pressure | Gastrointestinal problems | Chronic fatigue | All of the above |
| Right Answer | D | | | |

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| Question No. 28 | Which type of fire extinguishing system is most commonly used to protect areas containing valuable equipment such as data processing rooms, telecommunications switches, and process control rooms? | | | |
| Answer Options | A) | B) | C) | D) |
| | Fixed extinguishing systems | Portable extinguishing systems | Hose extinguishing systems | It's up to the discretion the employer |
| Right Answer | A | | | |

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|-----------------|--|--|--|------------------|
| Question No. 29 | If you need to wear glasses with your eye or face protection, which of the following options is acceptable | | | |
| Answer Options | A) | B) | C) | D) |
| | Wearing prescription spectacles with side shields and protective lenses that meet safety requirements and also correct your vision | Wearing goggles that fit comfortably over your glasses | Wearing goggles that have corrective lenses mounted behind the protective lenses | All of the above |
| Right Answer | D | | | |

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|-----------------|--|------------|------------|-----------|
| Question No. 30 | Under which Section of Environment Pollution Act, the CPCB can issue the directions directly to industries | | | |
| Answer Options | A) | B) | C) | D) |
| | Section 16 | Section 18 | Section 11 | Section 5 |
| Right Answer | D | | | |

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|-----------------|--|----------|-----------|-----------|
| Question No. 31 | Which of these divisions of Pollution Control Implementation deals with Air Polluting Industries | | | |
| Answer Options | A) | B) | C) | D) |
| | PCI - I | PCI - II | PCI - III | SSI & Law |
| Right Answer | B | | | |

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|-----------------|--|------|------|------|
| Question No. 32 | The Kyoto Protocol is an international treaty which extends the United Nations Framework Convention on Climate Change (UNFCCC). In which year the convention held? | | | |
| Answer Options | A) | B) | C) | D) |
| | 1987 | 1995 | 1992 | 1997 |
| Right Answer | C | | | |

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|-----------------|--|--|--|---|
| Question No. 33 | What is the harm from manipulation of Earth's Ozone layer? | | | |
| Answer Options | A) The average temperature of Earth's surface will increase gradually | B) The Oxygen content of the atmosphere will decrease | C) Increased amount of Ultraviolet radiation will reach earth's surface | D) Sea level will rise as the polar ice caps will gradually melt |
| Right Answer | C | | | |

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|-----------------|--|---------------------------------|------------------------------------|---|
| Question No. 34 | Which of the following would not represent the cash outflows for the business? | | | |
| Answer Options | A) Purchase of building for cash | B) The sale of land for cash | C) Retirement of long-term debt | D) The payment of cash for dividends |
| Right Answer | B | | | |

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|-----------------|---|-----------------|------------|-----------------|
| Question No. 35 | Which one of the following tangible fixed assets would not normally be depreciated? | | | |
| Answer Options | A) Buildings | B) Machinery | C) Land | D) Equipment |
| Right Answer | C | | | |

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|-----------------|---------------------------------|----------------------------------|--|----------------------------------|
| Question No. 36 | A Profit is earned if? | | | |
| Answer Options | A) Assets exceed Expenditure | B) Income exceeds Expenditure | C) Cash Inflow exceeds Cash Outflow | D) Income exceeds Liabilities |
| Right Answer | B | | | |

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| Question No. 37 | Which of the following budgets is normally prepared first? | | | |
| Answer Options | A) Cash budget | B) Sales budget | C) Merchandise purchases budget | D) Selling expense budget |
| Right Answer | B | | | |

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|-----------------|--|--|--|--|
| Question No. 38 | What is the correct sequence in the formation of a contract? | | | |
| Answer Options | A) Offer, acceptance, agreement, consideration. | B) Agreement, consideration, offer, acceptance. | C) Offer, agreement, consideration, acceptance. | D) Offer, acceptance, consideration, agreement. |
| Right Answer | D | | | |

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|-----------------|--|---|---|---|
| Question No. 39 | Which of the following answers is most accurate description of arbitration? | | | |
| Answer Options | A) | B) | C) | D) |
| | An informal meeting between the parties involving a discussion to sort out the dispute | An adjudicative process where the parties submit their disputes for a binding decision to an impartial tribunal | A meeting between the parties where an impartial third party gives decision | An impartial umpire selected to decide after hearing the dispute from parties |
| Right Answer | B | | | |

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|-----------------|---|-------------------|--------------|-----------|
| Question No. 40 | Which of the following answers is not type of alternative dispute resolution? | | | |
| Answer Options | A) | B) | C) | D) |
| | Arbitration | Court proceedings | Conciliation | Mediation |
| Right Answer | B | | | |

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|-----------------|---|------------------------------|----------------------------|-------------------------------|
| Question No. 41 | The equation of state for n moles of an ideal gas is $PV = nRT$, where R is the universal gas constant and all other quantities have their usual meanings. What are the dimensions of R? | | | |
| Answer Options | A) | B) | C) | D) |
| | $M^0L^2T^{-2}K^{-1}mol^{-1}$ | $M^0L^2T^{-2}K^{-1}mol^{-1}$ | $ML^2T^{-2}K^{-1}mol^{-1}$ | $ML^{-2}T^{-2}K^{-1}mol^{-1}$ |
| Right Answer | C | | | |

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|-----------------|---|------|------|-----|
| Question No. 42 | A cylindrical tube open at both ends has fundamental frequency n. If one of the ends is closed, the fundamental frequency will become | | | |
| Answer Options | A) | B) | C) | D) |
| | $n/2$ | $2n$ | $4n$ | n |
| Right Answer | A | | | |

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|-----------------|--|-----|--------------|--------------|
| Question No. 43 | The speed of sound in a gas is V and the root mean square speed of the gas molecules is V_{rms} . If the ratio of the specific heats of the gas is 1.5, then the ratio of V: V_{rms} will be | | | |
| Answer Options | A) | B) | C) | D) |
| | 1:2 | 1:3 | $1:\sqrt{2}$ | $1:\sqrt{3}$ |
| Right Answer | C | | | |

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|-----------------|---|-----------|-------------|--------------|
| Question No. 44 | Which of the following phenomena gives evidence of the molecular structure of the matter? | | | |
| Answer Options | A) | B) | C) | D) |
| | Brownian motion | Diffusion | Evaporation | All of these |
| Right Answer | D | | | |

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|-----------------|--|-------------------------|-------------------------|-------------------------|
| Question No. 45 | Starting with the same initial conditions, an ideal gas expands from volume V_1 to V_2 in three different ways. The work done by the gas is W_1 if the process is purely isobaric, W_2 if the process is purely isochoric and W_3 if the process is purely adiabatic. Then | | | |
| Answer Options | A) $W_1 > W_2 > W_3$ | B) $W_2 > W_1 > W_3$ | C) $W_1 > W_3 > W_2$ | D) $W_3 > W_1 > W_2$ |
| Right Answer | C | | | |

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|-----------------|--|-----------|-----------|---|
| Question No. 46 | A vessel contains a mixture of 1 mole of oxygen and two moles of nitrogen at 300K. The ratio of the rotational kinetic energy per O_2 molecule to that per N_2 molecule is | | | |
| Answer Options | A) 1:1 | B) 1:2 | C) 2:1 | D) Depends on the moment of inertia of the two molecules |
| Right Answer | A | | | |

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|-----------------|--|--------------------------|---------------------|----------------------------|
| Question No. 47 | In a test experiment on a model aeroplane in a wind tunnel, the flow speeds on the lower and upper surfaces of the wing are v and $\sqrt{2}v$ respectively. If the density of air is ρ and the surface area of the wing is A , the dynamic lift on the wing is given by | | | |
| Answer Options | A) $(\rho v^2 A) / \sqrt{2}$ | B) $(\rho v^2 A) / 2$ | C) $2\rho v^2 A$ | D) $\sqrt{2}\rho v^2 A$ |
| Right Answer | B | | | |

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| Question No. 48 | A boy whirls a stone in a horizontal circle 2m above the ground by means of a string 1.25m long. The string breaks and the stone flies off horizontally, striking the ground 10m away. What is the magnitude of the centripetal acceleration during circular motion? (Take $g=10\text{m/s}^2$) | | | |
| Answer Options | A) 400m/s^2 | B) 300m/s^2 | C) 200m/s^2 | D) 100m/s^2 |
| Right Answer | C | | | |

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|-----------------|--|-----------|-----------|---------|
| Question No. 49 | Radium (with Atomic no. = 87, Mass No. = 221) undergoes radioactive decay with a half-life of 4 days. The probability that a Ra nucleus will disintegrate in 8 days is | | | |
| Answer Options | A) 1/4 | B) 3/4 | C) 1/2 | D) 1 |
| Right Answer | B | | | |

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|-----------------|--|---------------|-----------|-------------|
| Question No. 50 | A tunnel is dug along the diameter of the earth. An object is held in the tunnel at a distance x from the centre of the earth. The magnitude of the gravitational force on the object is proportional to | | | |
| Answer Options | A) $1/x$ | B) $1/x^2$ | C) x | D) x^2 |
| Right Answer | C | | | |

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|-----------------|--|-------|------|--------|
| Question No. 51 | In International Standard Atmosphere (ISA), the ambient temperature at 1 km altitude will be | | | |
| Answer Options | A) | B) | C) | D) |
| | 0°C | 8.5°C | 15°C | 12.5°C |
| Right Answer | B | | | |

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|-----------------|--|------------------|---------------------|--------------------|
| Question No. 52 | The basic purpose of providing Vertical Tail in a fixed-wing aircraft is | | | |
| Answer Options | A) | B) | C) | D) |
| | Static Stability in Yaw | Trim in Yaw-axis | Control in Yaw-axis | Equilibrium in Yaw |
| Right Answer | A | | | |

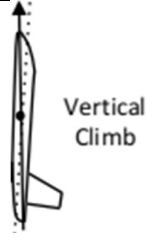
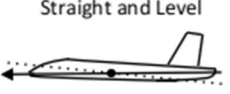

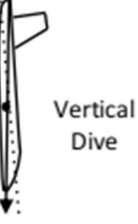
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|-----------------|---|------------------------|-------------------|------------------|
| Question No. 53 | Which altitude is used for aircraft performance evaluation and flight dynamic analysis? | | | |
| Answer Options | A) | B) | C) | D) |
| | Geometric Altitude | Geo-potential Altitude | Pressure Altitude | Density Altitude |
| Right Answer | C | | | |

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|-----------------|--|---------------------------|---------------------|--------------------------|
| Question No. 54 | When Indicated Airspeed (IAS) is corrected for Instrument Error and Position Error, it becomes | | | |
| Answer Options | A) | B) | C) | D) |
| | Calibrated Airspeed (CAS) | Equivalent Airspeed (EAS) | True Airspeed (TAS) | Rectified Airspeed (RAS) |
| Right Answer | A | | | |

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|-----------------|--|-----------|-----------|-----------|
| Question No. 55 | An Aircraft is flying at an Equivalent Airspeed (EAS) of 400 km/h at an altitude where density ratio(σ) is 0.25. What is the True Airspeed (TAS) of the aircraft? | | | |
| Answer Options | A) | B) | C) | D) |
| | 200 km/hr | 400 km/hr | 600 km/hr | 800 km/hr |
| Right Answer | D | | | |

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| Question No. 56 | Static port(s) of a Pilot Static tube on an aircraft are clogged/blocked. Which two on-board instruments will not function properly and will display erroneous results? | | | |
| Answer Options | A) | B) | C) | D) |
| | Altimeter and Artificial Horizon | Artificial Horizon and Heading Indicator | Altimeter & Airspeed Indicator | Turn & Bank Indicator and Airspeed Indicator |
| Right Answer | C | | | |

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|-----------------|---|-------|------|-------|
| Question No. 57 | An aircraft is flying in a steady level straight flight. Its total drag coefficient (C_D) = 0.03; its lift coefficient (C_L)=0.5 and lift dependent drag factor(k) = 0.06. Calculate the Zero Lift Drag Coefficient (C_{D0}) of the aircraft. | | | |
| Answer Options | A) | B) | C) | D) |
| | 0.01 | 0.015 | 0.02 | 0.025 |
| Right Answer | B | | | |

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|-----------------|---|---|--|---|
| Question No. 58 | Which among the flight conditions shown here will have load factor(n) on aircraft slightly lesser than unity? | | | |
| Answer Options | A)  | B)  | C)  | D)  |
| Right Answer | C | | | |

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|-----------------|---|--|---|--|
| Question No. 59 | What is the effect of head-wind on Take-off Ground Roll Distance (Ground Run) of an aircraft? | | | |
| Answer Options | A) It increases the Take-off Ground Roll Distance | B) It reduces the Take-off Ground Roll distance | C) It has no effect on the Take-off Ground roll distance | D) It doubles the Take-off Ground roll distance |
| Right Answer | B | | | |

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|-----------------|--|------------------------|----------------------------|--------------------------|
| Question No. 60 | Service ceiling of an aircraft is defined as the altitude where its maximum rate of climb is | | | |
| Answer Options | A) 500 ft/min (2.5 m/s) | B) 0 ft/min (0 m/s) | C) 100 ft/min (0.5 m/s) | D) 200 ft/min (1 m/s) |
| Right Answer | C | | | |

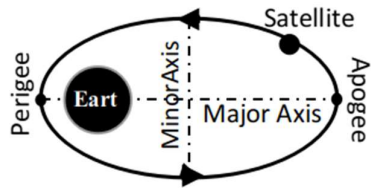
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| Question No. 61 | What among the followings is NOT TRUE about a satellite in Earth's Geo-stationary orbit? | | | |
| Answer Options | A) It is at an altitude of 36 km approx. | B) It has a time period of about 24 hours approx. | C) It is stationary at a fixed point in space | D) It has a circular orbit |
| Right Answer | C | | | |

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|-----------------|---|---|--|----------------------------------|
| Question No. 62 | For a satellite revolving in an orbit, the two forces which must equal/balance each other are | | | |
| Answer Options | A) Gravitation and Thrust | B) Gravitation and Centrifugal Force | C) Gravitation and Aerodynamic Drag | D) Gravitation and Lift Force |
| Right Answer | B | | | |

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|-----------------|--|---------------|----------------------|--------------|
| Question No. 63 | Orbital velocity(v) of a satellite about Earth is given by (where G= Universal Gravitation Constant, M = Mass of Earth, m =Mass of satellite, r = Distance between satellite & Earth's centre) | | | |
| Answer Options | A) $\sqrt{GM/r}$ | B) GMm/r | C) $\sqrt{GMm/r}$ | D) GM/r |
| Right Answer | A | | | |

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|-----------------|--|-----------------------|---------------------|-------------------|
| Question No. 64 | Which of the followings can be termed as a 'Centre Force'? | | | |
| Answer Options | A) | B) | C) | D) |
| | Frictional Force | Electromagnetic force | Gravitational force | Aerodynamic Force |
| Right Answer | C | | | |

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|-----------------|---|--------------------|--------------------|--------------------|
| Question No. 65 | Match the following planetary orbits to their eccentricity(e): 1) $e = 1$ a) Circular orbit 2) $e = 0$ b) Elliptical orbit 3) $e > 1$ c) Parabolic orbit 4) $e < 1$ d) Hyperbolic orbit | | | |
| Answer Options | A) | B) | C) | D) |
| | 1-C, 2-A, 3-D, 4-B | 1-A, 2-C, 3-B, 4-D | 1-C, 2-B, 3-A, 4-D | 1-B, 2-A, 3-D, 4-C |
| Right Answer | A | | | |

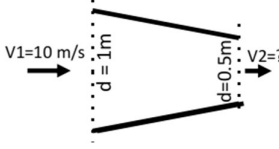
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| Question No. 66 | A satellite is revolving around Earth in an elliptical orbit as depicted in the figure here. At what location on the orbit the satellite will have least angular velocity? | |  | |
| Answer Options | A) | B) | C) | D) |
| | At both endpoints of Minor axis | At apogee | At perigee | Same velocity at all points |
| Right Answer | B | | | |

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|-----------------|--|---------------------------------|---------------------------------|-----------------------|
| Question No. 67 | Reynolds' no. (Re) is the ratio of | | | |
| Answer Options | A) | B) | C) | D) |
| | Inertia force/Viscous force | Gravitation force/Inertia force | Gravitation force/Viscous force | Lift force/Drag force |
| Right Answer | A | | | |

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|-----------------|---|--------------------------|------------------------------|-------------------------|
| Question No. 68 | Which two potential flows are required to be superimposed to obtain a Doublet flow? | | | |
| Answer Options | A) | B) | C) | D) |
| | Uniform flow + Source flow | Uniform flow + Sink flow | Sink flow + Free-vortex flow | Source flow + Sink flow |
| Right Answer | D | | | |

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|-----------------|--|-----------|-----------|-------------|
| Question No. 69 | Which of the following expressions represents the Potential Function(ϕ) of an ideal two-dimensional flow? | | | |
| Answer Options | A) | B) | C) | D) |
| | $X + Y$ | $X^2 + Y$ | $X + Y^2$ | $X^2 + Y^2$ |
| Right Answer | A | | | |

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|-----------------|---|-----------|-----------|-----------|
| Question No. 70 | Stream function(ψ) of an ideal two-dimensional flow is given by X^2+Y^2 . What will be the velocity of flow at a position $x = 0.5$ and $y=0.5$? Round-off the answer to one decimal place. | | | |
| Answer Options | A) 1.5 | B) 1.1 | C) 1.3 | D) 1.4 |
| Right Answer | D | | | |

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| Question No. 71 | Water is flowing through a horizontal convergent pipe. Inlet and outlet diameter of the pipe is 1 m & 0.5 m respectively. If the velocity at inlet section is 10 m/s, what will be the velocity at the outlet section? Assume viscous effects are negligible. | | | |
| |  | | | |
| Answer Options | A) 5 m/sec | B) 10 m/sec | C) 20 m/sec | D) 40 m/sec |
| Right Answer | D | | | |

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|-----------------|---|-----------------|-----------------|-----------------|
| Question No. 72 | An aircraft is flying at an altitude where ambient pressure (p_a) is 100 kPa and ambient density is 1 kg/m^3 . The total pressure (P_o) measured by an on-board instrument is 105 kPa. What is the true velocity of the aircraft? Assume the flow to be incompressible. | | | |
| Answer Options | A) 90 m/sec | B) 100 m/sec | C) 110 m/sec | D) 120 m/sec |
| Right Answer | B | | | |

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|-----------------|---|--------------------------------|--------------|-------------|
| Question No. 73 | Which of the following is NOT a geometric parameter of an airfoil | | | |
| Answer Options | A) Aspect ratio | B) Thickness to Chord ratio | C) Camber | D) Chord |
| Right Answer | A | | | |

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|-----------------|--|-----------------|------------------|-----------------|
| Question No. 74 | What is the maximum camber and maximum thickness of NACA2412 airfoil | | | |
| Answer Options | A) 12% and 2% | B) 2% and 4% | C) 2% and 12% | D) 4% and 2% |
| Right Answer | C | | | |

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|-----------------|--|-----------|------------|---------|
| Question No. 75 | Induced drag co-efficient (C_{Di}) for a wing of infinite Aspect Ratio will be | | | |
| Answer Options | A) 1 | B) 0.5 | C) 0.25 | D) 0 |
| Right Answer | D | | | |

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|-----------------|--|------------------|----------|----------|
| Question No. 76 | Lift is generated by turning the airflow by air-foil thereby causing change in | | | |
| Answer Options | A) | B) | C) | D) |
| | Kinetic energy | Potential energy | Momentum | Velocity |
| Right Answer | C | | | |

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| Question No. 77 | Match the followings: 1) Normal Stress/Normal Strain A) Modulus of Rigidity(G) 2) Shear Stress/Shear Strain B) Bulk Modulus(K) 3) Volumetric Stress/Volumetric Strain C) Poisson Ratio(γ) 4) Lateral Strain/Longitudinal Strain D) Young's Modulus(E) | | | |
| Answer Options | A) | B) | C) | D) |
| | 1-D, 2-A, 3-B, 4-C | 1-A, 2-D, 3-B, 4-C | 1-D, 3-A, 2-C, 4-B | 1-A, 2-D, 3-C, 4-B |
| Right Answer | A | | | |

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|-----------------|--|------|------|-----|
| Question No. 78 | What will be the Poisson's Ratio(μ) of a metal whose Young's Modulus of Elasticity(E) = Bulk Modulus(K). Assume the strains to be small. Round-off answer to two decimal places. | | | |
| Answer Options | A) | B) | C) | D) |
| | 0.25 | 0.28 | 0.34 | 0.4 |
| Right Answer | C | | | |



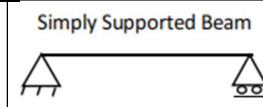

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| Question No. 79 | A wire is subjected to axial tension due to which length of the wire gets elongated by 8mm. If the length and diameter of the wire were doubled, what would be the elongation in length of the wire under the same axial load? | | | |
| Answer Options | A) | B) | C) | D) |
| | 2 mm | 4 mm | 8 mm | 16 mm |
| Right Answer | B | | | |

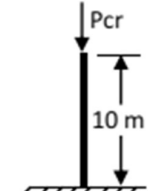
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| Question No. 80 | A planar structural element is subjected to two mutually perpendicular tensile stresses of 100 MPa in x-direction and 50 MPa in y-direction. What will be the Maximum Shear Stress developed in the element? | | | |
| Answer Options | A) | B) | C) | D) |
| | 150 MPa | 100 MPa | 75 MPa | 50 MPa |
| Right Answer | D | | | |
| NOTE | Question was displayed incorrectly at candidates' terminal. Hence '1' mark has been given to all candidates, who attempted or not. | | | |

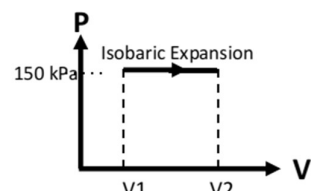
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| Question No. 81 | For a given 2-D planar state of stress, which of the following statements about Mohr's Circle is NOT true | | | |
| Answer Options | A) | B) | C) | D) |
| | Two intersection points of Mohr's circle with the X-axis (Normal stress axis) represent the Maximum & Minimum Principal stresses | All points on circumference of Mohr's circle represent different oblique planes and the corresponding values of Normal & Shear stress on those planes | The centre of the Mohr's circle lies on the Y-axis (Shear Stress axis) | The Maximum Shear stress equals the radius of the Mohr's circle |
| Right Answer | C | | | |

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|-----------------|---|---------|-----------|---------|
| Question No. 82 | A circular shaft of ductile material is subjected to bending and torsion. The principle stresses induced are 100 MPa and 50 MPa. Elastic limit of the shaft is 150 MPa. What is the design factor of safety as per TRESCA's Maximum Shear Stress Theory (MSST)? | | | |
| Answer Options | A) 15 | B) 2 | C) 2.5 | D) 3 |
| Right Answer | D | | | |

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|-----------------|---|-------------------------|-------------------------------|----------------------------|
| Question No. 83 | Von-Mises's 'Maximum Distorsion Energy' failure theory is basically based on the criterion of | | | |
| Answer Options | A) Max Shear Stress | B) Max Strain Energy | C) Max Shear Strain Energy | D) Max Principle Stress |
| Right Answer | C | | | |

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|-----------------|--|---|---|--|
| Question No. 84 | Which of the beams shown here is a Statically Indeterminate structure? | | | |
| Answer Options |  Cantilever Beam |  Fixed Beam |  Simply Supported Beam |  Overhang Beam |
| Right Answer | B | | | |

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|-----------------|---|-------------|-------------|-------------|
| Question No. 85 | A cylindrical solid column is 10-metre-high and 200 mm diameter. The Young's Modulus of Elasticity (E) for the column material is 100 GPa. As shown in the figure, the column is Fixed at the ground end and is Free at the top end. What will be the Critical load (P_{cr}) which the column can withstand without buckling assuming a factor of safety of 3? Round off answer to nearest integer. | | | |
| |  | | | |
| Answer Options | A) 50 kN | B) 55 kN | C) 60 kN | D) 65 kN |
| Right Answer | D | | | |

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|-----------------|--|--------------|--------------|-------------|
| Question No. 86 | An ideal gas having initial volume (V_1) of 0.1 m ³ is expanded to double its volume ($V_2=2V_1$) under constant pressure of 150 kPa. What is the work done in the process? | | | |
| |  | | | |
| Answer Options | A) 15 kJ | B) 1.5 kJ | C) 150 kJ | D) 30 kJ |
| Right Answer | A | | | |

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|-----------------|--|--|--|---|
| Question No. 87 | Which of the statements is FALSE in respect of modes of heat transfer? | | | |
| Answer Options | A) | B) | C) | D) |
| | Heat transfer by convection happens by actual movement of particles of the substance | Heat transfer by radiation happens through electromagnetic waves | Heat transfer by convection can happen in solids | Heat transfer by radiation can happen in vacuum |
| Right Answer | C | | | |

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|-----------------|--|------|------|------|
| Question No. 88 | A solid metallic ball of 1 kg mass is at a room temperature of 20°C. What will be the heat energy needed to be supplied to the ball to raise its temperature to 50°C? The specific heat capacity of the metal material is 100 J/kg/°C. | | | |
| Answer Options | A) | B) | C) | D) |
| | 1 kJ | 3 kJ | 2 kJ | 4 kJ |
| Right Answer | B | | | |

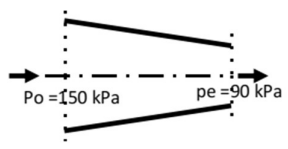
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| Question No. 89 | Which of the following statements is FALSE in respect of thermo-chemical process of combustion? | | | |
| Answer Options | A) | B) | C) | D) |
| | Energy is conserved | Number of atoms of the elements of mixture (fuel+air) are conserved | Mass is conserved. | Number of molecules of elements of the mixture (fuel+air) are conserved |
| Right Answer | D | | | |

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|-----------------|---|----------|----------|--------|
| Question No. 90 | Which type of engine is used to power modern passenger airliners e.g. Airbus-300/320/380, Boeing-737/747/777 etc. which cruise at high subsonic speeds (Mach 0.8 to 0.95) | | | |
| Answer Options | A) | B) | C) | D) |
| | Turboprop | Turbofan | Turbojet | Ramjet |
| Right Answer | B | | | |

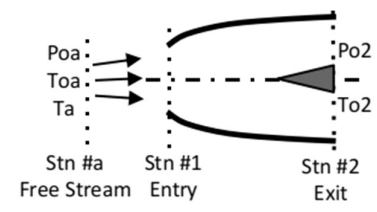
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|-----------------|--|-----|-----|-----|
| Question No. 91 | Propulsive Efficiency (η_p) of a turbojet engine is 60% and its Thermal Efficiency (η_{th}) is 40%. The Overall Efficiency (η_o) of this engine will be | | | |
| Answer Options | A) | B) | C) | D) |
| | 12 % | 20% | 24% | 50% |
| Right Answer | C | | | |

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|-----------------|---|---------|---------|---------|
| Question No. 92 | A jet-engined aircraft is flying with its engine producing 10 kN of thrust under the ideal condition of fully expanded jet flow. The inlet mass flow rate (\dot{m}) is 100 kg/s and the exhaust velocity (V_e) is 300 m/s. Assuming fuel-air ratio to be negligibly small, what is the speed at which the aircraft is flying? | | | |
| Answer Options | A) | B) | C) | D) |
| | 125 m/s | 150 m/s | 175 m/s | 200 m/s |
| Right Answer | D | | | |

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|-----------------|--|--|---|--|
| Question No. 93 | Which of the following statements is FALSE about afterburner as a thrust-enhancing device for jet engines. | | | |
| Answer Options | A) | B) | C) | D) |
| | It is used to Increase thrust for short periods of time | It is used on Turboprop and Turboshaft engines | It works by increasing jet exhaust velocity | It requires variable-area exhaust nozzle |
| Right Answer | B | | | |

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|-----------------|---|---|---|---|
| Question No. 94 |  <p>Consider one-dimensional isentropic flow of air through a simple convergent nozzle of a jet engine exhaust. The total pressure (P_o) at nozzle inlet is 150 kPa and the exit static pressure (p_e) is 90 kPa. Which of the following statements correctly describes the state of this nozzle flow?</p> | | | |
| Answer Options | A) | B) | C) | D) |
| | Flow is fully expanded, nozzle is choked and Mach number at exit is unity. | Flow is under expanded and Mach number at exit is lesser than unity | Flow is over expanded and Mach number at exit is greater than unity | Flow has not expanded at all and the Mach number at exit equals Mach number at entry. |
| Right Answer | B | | | |

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|-----------------|--|---|--|---|
| Question No. 95 | A single stage axial compressor comprises of one rotor and one stator. Assuming a typical Degree of Reaction (R_x)= 0.5 for the compressor, identify the INCORRECT statement about the change in air properties across rotor and stator. | | | |
| Answer Options | A) | B) | C) | D) |
| | Static pressure increases across rotor | Static pressure increases across stator | Absolute velocity increases across rotor | Absolute velocity increases across stator |
| Right Answer | D | | | |

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|-----------------|---|-------------|-------------|-------------|
| Question No. 96 | <p>A subsonic pitot type air Intake has free stream air Stagnation Pressure (P_{o1}), Stagnation Temperature (T_{o1}) and Static Temperature (T_1) as 140 kPa, 318°K and 288°K respectively. At diffuser exit, the total Pressure (P_{o2}) and total Temperature (T_{o2}) are 126 kPa and 315 °K respectively. What is the Isentropic Efficiency(η_d) and Pressure Recovery (p_d) of the intake diffuser.</p>  | | | |
| Answer Options | A) | B) | C) | D) |
| | 0.8 and 0.9 | 0.9 and 0.8 | 0.9 and 0.9 | 0.8 and 0.8 |
| Right Answer | C | | | |

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|-----------------|--|---|--|---|
| Question No. 97 | Which of the following statements is NOT TRUE about Combustion process in a Jet Engine | | | |
| Answer Options | A) | B) | C) | D) |
| | Total Pressure increases across the combustion chamber | Temperature and Velocity increase across the combustion chamber | Flame velocity in the combustion chamber is of the order of 1 to 2 m/s | Actual Air-to-Fuel ratio used in modern jet engine combustion is anywhere from 50 to 100 whereas the stoichiometric Air-to-Fuel ratio of Jet Engine fuels is around 15. |
| Right Answer | A | | | |

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|-----------------|---|--|---|--|
| Question No. 98 | Which of the following differences between Axial Flow Compressors and Axial Flow Turbines in a jet engine is INCORRECT? | | | |
| Answer Options | A) | B) | C) | D) |
| | Axial Flow Compressors operate under favourable pressure gradient whereas Axial Flow Turbines operate under adverse pressure gradient | Axial Flow Compressors may have many stages e.g. 8 or 10 whereas the number of stages in Axial Flow Turbines is limited, generally to < 3. | Temperatures in Axial Flow Compressors are relatively low whereas Axial Flow Turbines have very high temperatures | Axial Flow Compressors act as diffusers whereas Axial Flow Turbines act as nozzles |
| Right Answer | B | | | |

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|-----------------|--|----------|----------|-------------|
| Question No. 99 | As shown in figure here, gas mixture is entering rotor of an axial turbine stage with an absolute velocity of 200 m/s at 60 deg inclination with the axial direction and leaving with an absolute velocity of 115 m/s at 30 deg to axial direction. The rotor speed (tangential) is 100 m/s. What is the specific work done in the stage in kJ? Round-off answer to the nearest integer. | | | |
| Answer Options | A) | B) | C) | |
| | 37 kJ/kg | 32 kJ/kg | 23 kJ/kg | D) 45 kJ/kg |
| Right Answer | C | | | |

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|------------------|--|------|-----|------|
| Question No. 100 | Air is entering axially into an Impeller of a Centrifugal Compressor of 0.5m diameter which is rotating at 10000 rpm. The tangential component of the whirl velocity(V_{θ}) exiting the impeller is 235 m/s. How much is the Slip Factor(σ)? | | | |
| Answer Options | A) | B) | C) | D) |
| | 0.8 | 0.85 | 0.9 | 0.75 |
| Right Answer | D | | | |