**Ph.D. COMMON ENTRANCE TEST**­­

**SUBJECT – MECHANICAL ENGINEERING**

**Roll No:**

**PART B**

**Duration: 60 minutes Maximum Marks: 50**

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| **Instructions:**   1. **This entrance test question paper is not to be taken out of the examination hall** 2. **Question paper consists of Section A and Section B** 3. **Section A consists of 30 MCQs carrying 1 Mark each. Write the Alphabet of the correct answer in the space given.** 4. **Section B consists of Descriptive questions carrying 5 marks each. Restrict your answer to 500 words. Additional plain sheets have been attached to the question paper to answer Section B** |

**SECTION – A**

**Answer the following questions by writing the Alphabet of the correct answer in the Box given: 30 X 1 = 30**

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|  | Identify the error in the following sentence: "The scientists concluded that the new discovery might hold the key to curing several diseases, but its application remains a challenge."  a) concluded (CORRECT - past tense is appropriate)  b) discovery  c) curing  d) but |
|  | Which synonym best replaces "ambiguous" in the sentence: "The politician's statement was ambiguous, leaving the public uncertain about his true intentions."   * a) clear (opposite of ambiguous) * b) concise * c) direct (opposite of ambiguous) * d) open to interpretation (correct synonym) |
|  | Choose the correct form of the verb "to lie" in the following sentence: "The data lay untouched for years before researchers finally analyzed it."   * a) laid * b) lied * c) lying * d) lain (correct - past participle of "lie" indicating state) |
|  | Fill in the blank with the most appropriate preposition: "The company's success was attributed to its focus \_\_\_\_\_\_ innovation."   * a) on (correct - indicates direction or target) * b) in * c) of * d) at |
|  | Which phrase best describes the tone of the following sentence: "While some researchers disagree with the methodology, the study's findings offer valuable insights into the issue."   * a) Assertive and confident * b) Objective and balanced (correct - acknowledges opposing viewpoints) * c) Persuasive and argumentative * d) Humorous and lighthearted |
|  | If all dogs are mammals, and no rabbits are mammals, can we conclude that no dogs are rabbits?  a) Yes, definitely (CORRECT - because no rabbits are mammals, and all dogs are mammals, it follows that no dogs can be rabbits)  b) No, not necessarily  c) We need more information  d) It depends on the definition of "dog" |
|  | A car travels 200 km in 4 hours. At the same speed, how long would it take to travel 400 km?  a) 6 hours (CORRECT - speed = distance/time, therefore time = distance/speed = 400 km / 200 km/h = 2 hours)  b) 8 hours  c) 10 hours  d) Cannot be determined |
|  | There are 3 red marbles and 5 blue marbles in a bag. You close your eyes and draw two marbles one after the other. What is the probability that both marbles will be red?  a) 1/8 (CORRECT - there are 3 ways to choose a red marble initially, then 2 ways for the second marble, out of a total of 8 possibilities, 3 \* 2 = 6 / 8 = 3/4)  b) 3/8  c) 1/2  d) 5/8 |
|  | Five friends, Alice, Bob, Charlie, Diana, and Edward, are standing in a line. If Alice is always to the left of Bob, and Diana is always to the right of Charlie, which of the following statements is ALWAYS true?  a) Alice is to the left of Diana (CORRECT - as Alice is always left of Bob and Diana is always right of Charlie, Alice must be on the left side of the line relative to Diana)  b) Bob is to the right of Charlie  c) Edward is to the left of Alice  d) Edward is to the right of Diana |
|  | You have four coins: one is a fake that weighs slightly less than the others. How can you find the fake coin in a minimum of two weighing using a balance scale?  a) Weigh all four coins together once (CORRECT - if the total weight is off, the fake coin is among the three used; if not, the fake coin is the one not weighed)  b) Weigh two coins against each other, then repeat with the remaining two  c) Divide the coins into two groups and weigh them twice  d) Weigh individual coins against a known weight |
|  | Which of the following is NOT a characteristic of a good research question?   * a) Clear and concise (CORRECT - ambiguity makes it difficult to investigate) * b) Feasible to answer with available resources * c) Based on personal opinion or bias (introduces subjectivity) * d) Original and contributes to existing knowledge (redundant research is less valuable) |
|  | A researcher wants to study the effectiveness of a new teaching method. What is the MOST important consideration in choosing a research method?   * a) The cost of conducting the research * b) The availability of technology * c) The researcher's personal preference (CORRECT - the suitability for the question is key) * d) The potential for publication in academic journals |
|  | The results of a study show a statistically significant correlation between two variables. Can we conclude that one variable causes the other?   * a) Yes, definitely (incorrect - correlation does not imply causation) * b) No, not necessarily (CORRECT - other factors could be in play) * c) We need more research to be sure * d) It depends on the specific variables studied |
|  | In a research paper, the findings section should primarily: \*\*   * a) Discuss the importance of the research * b) Explain the research methodology in detail * c) Present the results of the study clearly and concisely (CORRECT) * d) Argue for the researcher's interpretation of the results |
|  | Ethical considerations are most important in research involving: \*\*   * a) Literature reviews (less potential for harm) * b) Surveys with anonymous participants * c) Experiments with animal subjects (CORRECT - potential for physical or psychological harm) * d) Data analysis using existing datasets |
|  | If a number is increased by 50%, what is the equivalent percent decrease to return to the original number?  a) 33.33%  b) 50%  c) 66.67% (CORRECT - (50% increase ÷ 1.5) x 100% = 33.33%)  d) 75% |
|  | A train travels 240 km in 3 hours. At the same speed, how long will it take to travel 600 km?  a) 4 hours (CORRECT - speed = distance/time, therefore time = distance/speed = 600 km / 240 km/h = 2.5 hours)  b) 5 hours  c) 6 hours  d) 7.5 hours |
|  | The ratio of oranges to apples in a basket is 3:2. If there are 30 oranges in the basket, how many apples are there?  a) 15 (CORRECT - 3 oranges: 2 apples = 1 orange: 2/3 apples, so 30 oranges = 15 x 2/3)  b) 20  c) 25  d) 30 |
|  | A rectangular garden has a length of 12 meters and a width of 8 meters. What is the perimeter of the garden?  a) 20 meters  b) 32 meters (CORRECT - perimeter = 2(length + width) = 2(12 m + 8 m) = 32 m)  c) 40 meters  d) 96 meters |
|  | If the simple interest on a loan of $1000 is $50 after 1 year, what is the annual interest rate?  a) 2.5%  b) 5% (CORRECT - interest = (principal x rate x time) / 100, so 50 = (1000 x rate x 1) / 100, and rate = 5%)  c) 7.5%  d) 10% |
|  | Which country successfully launched its first lunar rover mission in December 2023? –  a) United States –  b) China (CORRECT - China's Chang'e 6 mission landed on the lunar surface on December 13, 2023) –  c) India –  d) Japan |
|  | Who was recently elected as the new Prime Minister of Malaysia? –  a) Anwar Ibrahim (CORRECT - Anwar Ibrahim was sworn in as the 10th Prime Minister of Malaysia on November 24, 2023) –  b) Mahathir Mohamad –  c) Ismail Sabri Yaakob –  d) Muhyiddin Yassin |
|  | Which international climate change conference took place in December 2023? –  a) COP26 –  b) COP27 (CORRECT - COP27 was held in Sharm El-Sheikh, Egypt, from November 6 to November 18, 2023) –  c) COP28 –  d) UNFCCC Conference of the Parties |
|  | What was the major news related to the FIFA World Cup in December 2023? –  a) The host nation was announced. –  b) The qualifying rounds concluded. –  c) The official mascot was revealed. (CORRECT - La'eeb, a friendly cartoon character, was unveiled as the official mascot for the 2024 FIFA World Cup in Qatar) –  d) The tournament schedule was finalized. |
|  | Which major space exploration event took place in December 2023? –  a) The launch of the James Webb Space Telescope (already occurred in 2021) –  b) The landing of the Perseverance rover on Mars (already occurred in 2021) –  c) The Artemis I lunar flyby mission (CORRECT - The Artemis I Orion spacecraft successfully completed its flyby of the Moon on December 11, 2023)  d) The launch of the Hubble Space Telescope successor (no confirmed successor yet) |
|  | Which of the following is NOT a characteristic of a good research question?   * a) Clear and concise (CORRECT - ambiguity makes it difficult to investigate) * b) Feasible to answer with available resources * c) Based on personal opinion or bias (introduces subjectivity) * d) Original and contributes to existing knowledge (redundant research is less valuable) |
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**Section - B**

**Answer any four questions (Each question carry 5 marks 4\*5 = 20**

* 1. Explain the working principle of a four-stroke internal combustion engine and highlight the difference between spark-ignition and compression-ignition engines. Discuss the significance of valve timing in engine performance.
  2. Compare and contrast the properties and applications of common engineering materials like steel, aluminum, and polymers in mechanical engineering design. Consider factors like strength, weight, cost, and corrosion resistance.
  3. Briefly explain the concept of gear trains and their role in power transmission within machines. Discuss the different types of gears, such as spur gears, bevel gears, and worm gears, and their suitability for different applications.
  4. Differentiate between casting and forging, highlighting the advantages and disadvantages of each process.
  5. Briefly explain the working principle of CNC machining and list its benefits compared to traditional machining methods.
  6. Draw and explain IRON, IRON CARBIDE diagram.

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