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1 Discuss the different types of engineering research. Clearly point the differences between all of them with examples

Descriptive versus Analytical

- Descriptive research includes comparitive and co relational methods, and fact-finding inquiries, to effectively describe the present state of art.
  In analytical research, already available facts for analysis and critical evaluation are utilized

- The researcher holds no control over the variables, rather only reports as it is

- Descriptive research also includes attempts to determine causes even though the variables cannot be controlled
  Some research studies can be both descriptive and analytical

Applied Engineering Research	Fundamental
- Pure research	- Basic Research
- Seeks to solve an immediate problem facing organization	- Is concerned with generalization and formulation of theory
- The primary objective of this is to determine a sol" for compelling problems in actual practice	- Basic research is aimed at seeking info which could have broad base of application

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Quantitative	Qualitative
• Uses statistical observations of sufficiently large no. of representatives cases to draw any conclusions	• This research rely on few non-representative cases in behavioral studies such as clustering effect in intersections in transportation engineering to make a preposition

2. List the different types of research misconduct and provide a brief explanation for each

→ Fabrication:
It is the act of conjuring data or experiments with a belief of knowledge about what the conclusion of the analysis or experiments would be, but cannot wait for the results possibly due to timeline pressures from supervisor or customers

→ Falsification:
• Falsification is the misrepresentation of data or experiments, even if partly, to support a desired hypothesis even when the actual data received from experiments suggests otherwise.

" Falsification and fabrification of data and results, hamper engineering research, causes false empirical data to percolate in the literature, wreck trustworthiness of individuals involved.

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→ Plagiarism:

- Plagiarism is taking other's work sans attribution. It takes place when someone uses or reuses the work of others as if it were his/her own without explicit acknowledgement

- Verbatim copying or reusing one's own published work is termed as self-plagiarism and is also an unacceptable practice in scientific literature

- The increasing availability of scientific content on the internet seems to encourage plagiarism in certain cases, but also enables detection of such practices through automated software packages

3. What are the factors that motivate you to do engineering research? Briefly explain

- Studies have shown that intrinsic motivations like interest, challenge, learning, meaning and purpose are linked to strong creative performance

- Extrinsic motivating factors like rewards for good work include money, fame, awards, praise and status are very strong motivators but may block creativity.

Ex: Research outcome may enable obtaining a patent which is good way to become rich and famous

- Influences from others like competition, collaboration, commitment and encouragement are also motivating factors in research

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- Personal motivation in solving unsolved problems, intellectual joy, service to community, and respectability are all driving factors

- Wanting to do better than what has been achieved in the world.

- Improve the state of art in technology

- Contribute to the improvement of society

- Fulfillment of historical legacy in the immediate socio-cultural context

- Several other factors like government directives, funding oppurtunities in certain areas, and terms of employment, can motivate people to get involved in engineering research

4. What are the key ethical issues related to authorship Explain each one.

- Academic authorship involves communicating scholarly work, establiship priority for their discoveries and building peer-reputation and comes with intrinsic burden of acceptance of the responsibility for the contents of the work.

- Credit for research contribution is attributed in three ways in research publications: by authorship, citation and through a written acknowledgement.

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- Authorship establishes both accountability and gives due credit. A person is expected to be listed as an author only when associated as a significant contributor in research design, data interpretation or writing of the paper.

- Sometimes, the primary author dubiously bestows co-authorship on a junior faculty or a student to boost their chances of employment or promotion which can be termed as Career-boost authorship

- In another type of questionable authorship, some researchers list one another as coauthors as a reciprocal gesture with no real collaboration except minimal reading and editing, without truly reviewing the work thread bare.

- The All listed authors have the full obligation of all contents of research article and naturally they should also be made aware of a journal submission by corresponding author

- Double submission is an important ethical issue related to authorship, which involves submission of a paper to two forums simultaneously.

5. What is the meaning of ethics and why is it important in the practice of engineering research?

Ethics refers to a set of rules distinguishing acceptable and unacceptable conduct, distinguishing right from wrong as such

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- Technological developments raise a whole range of ethical concerns such as privacy issues and data related to surveillance systems, and so engineering researchers need to make ethical decisions and are answerable for the repercussions borne out of their research as outcomes

- The reason that ethics matter in data used in engineering research is usually because there is impact on humans

- We have unprecedented access to data today, and unprecedented options for analysis of these data and consequences in engineering research related to such data

- Engineering ethics gives us the rule book tells us how to decide what is okay to do and what is not.

- Researchers make many choices that matter from an ethical perspective and influence the effects of technology : By setting the ethically right requirements at the very outset, engineering researchers can ultimately influence the effects of developed technology

- If possible, the designs should be made inherently safe such that they avoid dangers.

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6. What are the primary goals of conducting a literature review in academic research?

- Identify the research problem:
This includes understanding the current state of knowledge on the topic, identifying gaps in knowledge, and determining the research questions that need to be answered

- Advocate a specific approach:
This involves evaluating the different approaches that have been taken to study the problem, and selecting the approach that is most likely to be successful

- Evaluate the choice of methods:
This includes assessing the validity and reliability of the methods that have been used.

- Demonstrate the need for new research:
This involves showing that the existing research is not sufficient to answer the research questions and that new research is needed to make progress.

7. What are the key features of bibliographic database of the web of Science (WOS), and how is it commonly used in research?

- Web of Science includes multiple databases as well as specialized tools

- It is a good search tool for scholarly materials

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requiring institutional license and allows the researcher to search in a particular topic of interest

- The tool also allows sorting by number of citations, publication date.

- Cited reference search option enables a researcher to trace articles which have cited a formerly published paper.

- A structured search like this that enables narrowing and refining what one is looking for is effective to ensure that the results throw up relevant sources and time spent in studying those is likely to be well utilized.

- Based on researcher's need the search result can be broadened or narrowed down using the built-in fields provided in this website.

8. List and explain the importance of note-taking while reading research papers.

- A researcher reads to write and writes well only if the reading skills are good.

- The bridge b/w reading and actually writing a paper is the act of taking notes during and shortly after the process of reading.

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- Many researchers take notes on the margin of their copies of papers or even digitally on an article aggregator tool.

- In each research paper, there are a lot of things that one might like to highlight for later use such as definitions, explanations and concepts

- If there are questions of critisisms, these need to be written down so as to avoid being forgotten later on. Such efforts pay significantly when one has to go back and reread the same content after long time.

- On completing a thorough reading, good technical reading should end with summary of the paper in a few sentences describing contributions

9. Define the term citation. Describe three functions of citation.

- Citations credit others for their work, while allowing the readers to trace the source publication if needed.

- Citations help the readers to verify the quality and importance of new work and justification of the findings. It is a way to tell readers that certain material in the researcher's present work has come from another source and as an ethical responsibility; appropriate credit has been given to the original author or writer.

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- Three main functions of citation:

→ Verification function:-
Authors have scope for finding intentional or unintentional distortion of research or misleading statements. Citation offers the readers a chance to ascertain if the original source is justified or not

→ Acknowledgment function:
Researchers primarily receive credit for their work through citations. Citations play crucial role in the promotion of individual researchers and their continued employment. 1

→ Documentation function:-
Citations are also used to document scientific concepts and historical progress of any particular technology over the years

10. Explain the most common styles for citation used by engineers during research, and provide an example

Citation styles differ primarily in the order and syntax of information about references, depending on difference in priorities attributed to concision, readability, dates, authors and publications

→ ASCE style
American Society of Civil Engineers

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Template for books:
Author Surname, Author Initial, Title, Publisher, City, Pages Used.

Ex: Wearstler. k and Bogart J (2004), Modern glamour, Regan Books, N Y.

Template for websites:
Author Credentials / Company Name (Year Published), 'Title'. http://Website URL (oct. 10, 2013)

Ex: Blade Cleaning services (2015): http://www.bladecleaning.com/problematica (29 Oct, 2016).

Template for Journal publications:
Author Surname, Author Initial (Year Published). 'Title', Publication Title, Volume number (Issue number), Pages Used.

Ex: Johnston. L. (2014). "How an Inconvenient Truth Expanded the Climate change Dialogue and Reignited / An Ethical Purpose in the United states". 1-160.

→ IEEE style: [Institute of Electrical and Electronics Engg]

Chapter in an edited book
[1] A. Rezi and M. Allam, "Techniques in array processing by means of transformations", in Control and Dynamic Systems, Vol. 69, Multidimensional systems, C. T. Leondes, Ed. San. Diego: Academic Press, 1995, pp. 133-180.