AS-632

Pre-Ph.D. Course Work Examination, 2014

Mathematics

Fundamentals of Research in science

Model Answer
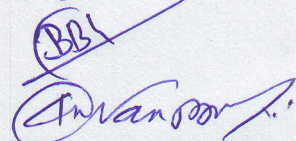
B.B. chaturvedi and KNVVV PRASAD

1 (i) Pursuit of science in the context of work-life would mean attainment of exceptional achievement or success in some area of work-life. (or). any other meaningful definition considered

(ii) examples of ethical issues in research publications
(1) Peer-reviewed original research
(2) Peer-reviewed research designed to repeat old experiments
(or) any valid examples considered

(iii) Examples of ethical issues in space research energy
(1) using the bomb exploration for launching the satellite vehicles

(or) any other valid ethical issue is considered with short explanation

(iv) Example of ethical values in social science
one of the examples is ~~humanity~~ or any valid ethical values in science is considered with explanation

(v) Ethical issues in medical research where it is violated

using oxitosin medicine is one of the example.
(or) any other valid example is considered

(vi) Two ethics of scientists for social responsibility
(i) ~~the~~ Military scientist maintain secrecy of military research details.
(ii) In the education system the using ICT from scientist

with explanation any two ethics considered

Q. 1, 2, 3

Q. 4, 5, 6

Section-B

Q.No 2, 3, 4

2. (i) Justice : The word justice has different connotations in different context, it is an important ethical virtue of a good person. justice means the principles according to which social institutions should be organized and operate in a just society.

(And briefly explaining)

(ii) Rule of law : Rule of law is a basic value of a good society - An important function of law and law courts in a democratic country is to protect the common man from arbitrary or injustice exercise of vast powers vested in the state and its various organs

(And pointwise explandia considered)

(iii) Social values in the Indian Constitute explanation is needed the following terms Right to equality - Right to freedom - Right to exploitation - Right to freedom of religion.

(And pointwise relationship considered)

3. (i) The spiritual wisdom of upanishad explain the following words : the way of knowledge - Raj yoga - the path of action - the path of devotion - spiritual autonomy - Egolessness - complete freedom - universal and unconditional love.

(or any other related topics considered)

(ii) Science, materialism and spirituality

A briefly explandia is needed in each term i.e Science, materialism and spirituality

4 Relationship between Mentor and mentee

This relationship should be viewed as a partnership of sorts where mentor and mentee both benefit from

work together. Although this relationship usually benefits both parties and the scientific profession, some ethical problems can arise. A first problem is that mentors may exploit mentees. A second problem that can arise is that students may not receive adequate mentoring. (And explanation is needed in each ethical issues and also considered valid ethical issues with explanation).

Q.2 and Q.3 BB1

Q.4 Davenport

Ans Que 1 part (vii). Let Bel denote the belief measure on some universal set X and $A, B \in \ell(X)$ be such that $A \subseteq B$. Set $C = B - A$ then $A \cup C = B$ and $A \cap C = \phi$. So by superadditive property of Bel we have

$$Bel (B) = Bel (A \cup C) \geq Bel (A) + Bel(C) - Bel (A \cap C).$$

Since $A \cap C = \phi$ and $Bel(\phi) = 0$, it follows that

$$Bel (B) \geq Bel(A) + Bel(C) \geq Bel (A) \quad \text{as } Bel(C) \geq 0.$$

Thus $A \subseteq B \Rightarrow Bel(A) \leq Bel(B)$ i.e. Belief measure satisfies monotone property.

Part (viii) A probability measure Pro on a universal set X may be defined as : For any $A \in \ell(X)$ set

$$Pro (A) = \sum_{x \in A} p(x) \quad \text{where } p(x) \ x \in X \text{ is referred}$$

as probability distribution on X. Further Pro must satisfy

$$Pro (A \cup B) = Pro (A) + Pro (B) \quad \forall \ A, B \in \ell(X)$$

such that $A \cap B = \phi$.

Part (ix) Two marginal distributions $p_X(x)$ and $p_Y(y)$ are called independent if and only if

$$p_X(x) = p_{X|Y}(x|y) \quad \text{and}$$

$$p_Y(y) = p_{Y|X}(y|x) \quad \forall \ x \in X \ \& \ \forall y \in Y$$

where $p_{X|Y}(x|y)$ and $p_{Y|X}(y|x)$ denote corresponding conditional probability distributions.

Que. 5 (a) Student may define the two concepts in their own words and may compare them from the point of view of the type of uncertainity these concepts deal. The student may also discuss the ~~properties~~ requirements of fuzzy measures. in short.   9 Marks.

Que 5 (b). The student may either

(1) define both measures seperately and establish the duality by means of ~~their~~ additive properties

OR

(ii) define one of the measures first and then link with another by a relation

$$Pl(A) = 1 - Bel(\bar{A}) \quad \text{or} \quad Bel(A) = 1 - Pl(\bar{A})$$

He/She must then observe that

(a) $Bel(A) + Bel(\bar{A}) \leq 1$ while $Pl(A) + Pl(\bar{A}) \geq 1$

(b) how both measures can be linked with fuzzy measure

(c). $Pl(A) \geq Bel(A)$.

8 Marks.