GENERAL STUDIES

Name of Candidate: Ajay Lunach
Test Code: M-105
Schedule:
Registration No.: 539
Place:  
Time:  
Module:
Classroom:  
Distance Learning:  
Classroom & Distance Learning:  

EVALUATION INDICATORS
1. Alignment Competence
2. Context Competence
3. Content Competence
4. Language Competence
5. Introduction Competence
6. Structure - Presentation Competence
7. Conclusion Competence

INSTRUCTIONS:
1. Do furnish the appropriate details in the answer sheet (viz. Name, ID Number and Test Code). The Candidate should fill the index table, especially for him/her.
2. In the left margin, she/he should write only question number and in the right margin, nothing should be written.
3. The page number should be coded by the candidate himself and the range of page number related to the answer of the question should be used to complete the index table.
4. All Parts of the questions should be written at one place.
5. No Supplementary sheet shall be provided by the management. So the candidate is advised to accommodate required information within the space provided.
6. The candidate need not write anything in his/her answer that derogates the dignity of an individual or an organization.
7. The candidate should respect the instructions, given be the invigilator.
8. The Examinee has to submit the answer sheet to the invigilator after completion of examination.
9. However, he/she is allowed the take away the question paper.

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Total Marks Obtained

Remarks:

Signature of Examiner

103, 1st Floor B/1-2, Ansal Building, Behind UCO Bank, Dr. Mukherjee Nagar, Delhi-09

ASHWIN SIR  19/8/12
1. (a) Drug resistance is the resistance shown by disease causing microorganisms to drugs. The process was noticed when Penicillin was found to be ineffective against some microbial species after long successful period.

Drug resistance is of chief concern because

* medicine that used to be effective will now do not work any more,
* Besides causing unsolved health problems, it entails additional expenditure to discover new drugs.
* Drug resistance can pass from one species to another. It makes our fight against disease even tougher.

Such resistances appear due to molecular changes in active site where our drug works.
act and block it. New changes can change shape of active site. Mutation also can lead to such changes. Further, a new active site altogether may be formed, decreasing importance of old site. Poreability of cell membrane to drug molecules can decrease. Transfer of resistance can be down the generations where modified resistant microbe multiply. Horizontal gene transfer and absorbing cell debris from dead resistant microbes can also do it.

India has contributed to growing drug resistance, as was seen in NDM superbug. Reason is indiscreet use of drugs. Disposal rules for medicines are not enforced, and find it way into open environment.
To fight this menace, excess medicines must be returned to chemist, and then to pharma company which must properly dispose the medicines so that they do not contaminate environment.

Proper monitoring of drug resistance and disposal practice is needed.

Thus, India can take lead in fighting drug resistance thus saving life of millions patients worldwide.
Recently, researchers at CERN, Geneva announced that they have probably discovered Higgs Boson, the 'God Particle' theorized by Peter Higgs.

Higgs boson is the key particle in the Standard Model Theory of Particle Physics. Higgs bosons are massless particles, which interact with all pervasive Higgs field to generate all different particles. Higgs field gives particles their weight. Higgs boson is said to have existed in fraction of a second after the Big Bang.

Using Large Hadron Collider (LHC), scientists at CERN attempted to recreate the conditions in the billionth fraction of second after Big Bang. Particles, neutrons were accelerated to near light...
speed and collided and resulting in dissimilation and formation of new particles.

Using sensors like OPAL, ATLAS, CMS, these particles were detected. A small bump in graph for mass of particles observed was noticed. This is believed to be a Higgs Boson, with more than 95% certainty.

The experiments were repeated with different detectors, and same results were

If Higgs Boson is found to exist, it will be a big discovery and uphold validity of Standard Model theory. It will explain why some particles have mass, others don't. It will also hint to existence of dark matter and dark energy.

If it doesn't, scientists can look for other explanations for mass of particles.
and origin of universe

The discovery of Higgs
Boson, is therefore, major
breakthrough of 21st century.
2(b) West Asia has been witnessing great turmoil in the past 2 years. In this scenario, India has carefully guarded its foreign policy to protect its interests.

Starting with Tunisian and Egyptian revolutions in 2011, India welcomed the first democratic revolution and favoured a peaceful transition to democracy.

In Libya, India favoured the same stance, opposed foreign intervention, and stood for Libya's right to resolve internal matters on its own.

In ongoing U.S.-Iran conflict, India has reluctantly sided with USA for economic sanctions against Iran. It managed to get exemptions, and its oil trade, though

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Again, in Syrian conflict, Indra initially supported Peace Assad efforts for peace reform to democracy. Seeing violent repression, it voted against Syria in UNSC. But has refrained from last round of voting.

Indra has also maintained friendly ties and defence trade with Israel.

Thus, Indra's approach is guided by:
- Energy security
- Welfare of Indians abroad
- It's passion for democracy
- Peaceful transition
- Sovereignty of West Asia
- Friendly ties.

India has thus taken a balanced approach in West Asia.
3. (b) Biotechnology is a vast emerging field that has impacted every other field of human activity.

Blue Biotechnology means applications in marine life. Using biotechnology to improve fisheries, increase fish catch, also improve nutritional value of seafood.

Green Biotechnology is application in agriculture leading to drought-resistant, fast growing, more nutritious, pest-resistant, disease-resistant crops.

White Biotechnology is its application in dairy industry. It is used to improve milk yield in animals, enhance life of milk, better milk products.

Thus, biotechnology has reached out to all other fields and
3(d) Biodiversity is the diversity of species in an ecosystem. It shows richness of gene pool. It is however, declining in recent years.

Major causes for decline are:

* Human encroachment of wildlife habitats
* Hunting, poaching, etc.
  - Animals like Tiger, Rhino
* Climate change
* Pollution - e.g., increasing temp. and pH of water, decrease in water sources
* Biotechnology - new, stronger species outcompete wild species in growth.

Our attempts to conservation have yielded limited success because protected areas are still not
Protection is inadequate even in these areas.

* Climate change and pollution is increasing at an unprecedented speed.
* Not all species are documented. In absence of documentation, protection measures cannot be taken.
* Faulty conservation approaches are a pressing need for economic exploitation of species.
* Local communities not involved in process. Corrective measures must be taken to bring biodiversity conservation back on track.
(a) Automation and robotics are often used interchangeably. Automation means allowing machine taking decisions on its own, since automation can be pre-programmed and limited in purpose.

Robotics is a step ahead of automation. It aims at constructing automated machines that are able to take intelligent decisions (increasing artificial decision intelligence) and more multipurpose in character.

Automation has limited interaction with environment. Robotics actively...
interacts with environment through sensors take intelligent decisions and act and sense environment again.

(b) With advance of technology various beneficial uses for waste material are found, most important being energy generation. A common technique is incineration. Combustible material will give heat energy. However, it is polluting.

Anaerobic digestion of waste material release gases like CH4, which can be more cleanly combusted to give energy. This is applied in biogas plants. Aerobic digestion by microbes is also used, and it is la faster.

In cities solid waste produce combustible gases on
decomposition which are used for energy.

1. (d) IPv6 standard is new standard for assigning web addresses and is set to replace IPv4 (Internet Protocol version 4).

IPv4 problem was that was running out of web addresses following exponential increase in web pages. IPv6 greatly enhances this limit, and opens way for many more years.
(e) Deep sea mining is exploration, digging, and extracting of deep sea (beyond continental shelf) for extracting economic extraction of minerals.

It is gaining in importance because:
- Most advanced countries have largely exploited their resources base, and need more resources to continue growth.
- Oceans are still now unexploited, and vast in expanse.
- Oceans have vast reserves of minerals.

Pelagic deposits, especially Poly Metallic Nodules (PMN) offer great opportunity for exploitation.

Mineral fuels, shale gas, and crude oil, prospects are
Key to future energy security

Thus, deep sea mining is growing in importance and holds key to economic growth.

5(d) Indian Space Research Organization (ISRO) is the national space agency. It has taken up various space research projects, aimed to benefit mankind.

Major focus areas of ISRO have been:

* Communication technology through INSAT satellite system. This has fuelled telecommunication revolution in India, mobile news-gathering, Direct to home satellite TV etc.
* Resource mapping of country - mineral mapping, forest cover, soil types, ocean bed
Study

+ Hazard Meteorology - Study of atmospheric conditions and short term and long term forecasts e.g. Meghraj Tropiques satellites

To diversify its field, ISRO has major upcoming projects:

+ Going for space exploration, ISRO will start Mars Mission that will study Moon's Mar's atmosphere and its surface

+ Aditya satellite, will study coronal heating and effect on magnetosphere and Earth

+ Chandrayaan-II mission that involves rover on moon to study its rocks.

+ Augmenting GPS, it plans to set up GAGAN through setting up Regional Navigation Satellite System, which will help reliable
VISION IAS™

and more accurate positioning.

ISRO has helped country through:

* Satellite education-Distance learning programs
* Fostering telecommunication revolution
* Bringing e-governance. Panchayat villages will be given Village Resource Centers for better service delivery.
* Hazard prediction (Tsunamis, cyclones)
* Mineral mapping of country
* Bringing foreign exchange by launching foreign satellite
* Security of nation by spy satellites (IRISAT-2)

ISRO, has thus, major role in development of nation.

7(c) Global Burden of disease maps the disease distribution geographically, and sees which are the regions where a disease is concentrated.
3(d) Government has launched a National Mission on Enhanced Energy Efficiency to address challenges to energy security.

It's major highlights are-

* Replacing old technologies with more energy efficient technologies in transport, household sector, lighting, etc.

* Replacing incandescent bulbs with energy saving CFLs.

* Improving load factor in our coal-based thermal power plants to boost efficiency of power transmission.

* Preventing theft of power.

* Efficiency in power generation.

Improved setting up of UMPP (Ultra Mega Power Plants) which use super critical technology.
* Rationalizing pricing of power to reduce wastages.
* Using more efficient fuels (e.g. Bharat Stage IV)
* International support, collaboration in research and technology sharing
* Proper building codes to save energy
* Awareness campaigns and Energy Audits

Thus, it encompasses wide, comprehensive measures for energy efficiency.

6(a) Central Water Commission is a proposed central regulatory body to oversee water distribution, usage, and ensuring its efficient use. It can recommend policy interventions to promote efficiency in water use.
Eclipse occurs when two apparently same sized heavenly bodies pass each other. Eg. Moon and Sun.

Occultation occurs when a larger apparently larger heavenly body completely covers a smaller body from view. Eg. Moon and distant star.

Transit occurs when apparently smaller body travels in front of a larger body. Eg. Venus transit of Sun.

Fly ash is by waste residue from mining. It consists of tiny microscopic particles composed of oxides of silicon, aluminum, etc. It is totally non-organic metals like arsenic, cadmium. It can be used to increase...
soil fertility, permeability, and water retention capacity after ensuring low levels of heavy metals.

(c) Mars Science Laboratory is a Mars exploration project of NASA, launched in November 2011. It entered the Mars atmosphere and successfully landed Curiosity Rover in Gale Crater in August 2012. Curiosity will explore Mars geology, ability to sustain life.

(d) Global Warming Potential is the potential of a greenhouse gas to cause an increase in global temperature. It is high for methane, nitrogen oxides, etc.

(e) National Large Solar Telescope (NLSST) is the largest telescope.
In country established located near Pahalgam, Tso Lake, Jammu & Kashmir. It will study sun atmosphere.

(b) Fuel cells are used to produce energy by combustion of $H_2$ and $O_2$ to give water. These are used in space launch vehicles and spacecrafts.

7(a) Ultra High Definition TV is next generation of TV that offers high quality picture and sound.

7(c) Space solar power is used by satellites and space stations through solar panels. It powers them. Other way is harnessing solar power through solar sails, solar tethers.
Space law is international law that governs the space use by countries. It prohibits militarization of space. It also upholds right of country for use of space above them. Countries can lease their space to other countries. It also controls details of management of space debris.

Probiotics are dietary supplements to enhance gut flora.

Effects

- Friendly bacteria help in digestion.
- Prevents growth of harmful bacteria.

Side effects

- Acute pancreatitis.
- Acidity
- Mass killing of harmful bacteria lead to toxin secretion
- It deviate away from digestive bacteria cause harm.
8(b). Certified Emission Reduction units are granted to projects under the Kyoto Protocol that lead to reduction in emissions through carbon sequestration. It is used in Clean Development Mechanism (CDM) of the Kyoto Protocol.

8(c). BrahMos-II is the next version of the India-Russia jointly developed Brahmos missile. It is under development. It is a hypersonic cruise missile that will be faster, more warhead capability and stealth technology than BrahMos-I.

8(d). DATE is a technology initiative by CSIR to track Epidemic using social media posts by over million users. It involves study of social behaviour to determine spread of epidemic.

8(e). Eutrophication is uncontrolled growth of algae due to flow of fertilizers from soil.
increases B.O.D and decreases dissolved oxygen creating dead zones.

8. (c) IBM Sequoia is the world's fastest supercomputer developed by IBM. It will control security of nuclear weapons in USA. It has speed close to 1 petaflop.

9. (b) Biomedical Engineering & Application of Biotechnology in Medical Science to develop pharmaceuticals, study of disease causes, and their cure.

9. (c) Hydraulic fracturing is fracturing of rocks under high pressure by water.

9. (d) SARAL is a satellite launched by ISRO with payload ARGOS and AltiKa that will study atmosphere phenomenon.
9.(d) Genetic testing is testing of genome to find locate cause of disease so that appropriate gene may be blocked/activated.

9.(b) Aditya is a upcoming satellite by ISRO to be placed in low Earth orbit to study impact of coronal heating on earth magnetosphere.

9.(c) Black holes are highly dense, heavenly bodies that have contracted in such a way that even light cannot escape them.

9.(k) Ecosmart is scheme by Government of India to label products that have been manufactured eco-friendly.

9.(d) Horspi Rimo is robot by Japanese company that helps old people do exercise. It can speak basic instructions.
### Question 12(a)

<table>
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<th>Interval</th>
<th>Frequency</th>
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<td>71-75</td>
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<tr>
<td>116-125</td>
<td>35</td>
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<tr>
<td>111-115</td>
<td>50</td>
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<td>106-110</td>
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<tr>
<td>80-84</td>
<td>90.5</td>
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<tr>
<td>79-80</td>
<td>500.5</td>
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</tbody>
</table>

**Total Frequency:** 1000

(a) 25% most intelligent = 25% of 500 = 125.

Least Interval: 106-110.

\[
110 = \frac{125 - 100}{60} \times 4
\]

\[
110 = 1.67 \times 4
\]

\[
110 = 6.68
\]
(i) 25% least intelligent

\[ \text{to } = 75\% \quad \text{Q}_{500} = 35.5\% \text{ interval: } 86-90 \]

\[ 10 = 85 + \left( \frac{125-95}{70} \right) \times 4 \]

\[ = 87.71 \]

(ii) Mode = 50\% Q distribution

\[ \text{Interval: } 101-105 \]

\[ \text{Mode} = 105 - \left( \frac{250-160}{100} \right) \times 4 \]

\[ = 101.4 \]

11(a) It can be represented by

\begin{tabular}{|c|c|}
\hline
\textbf{Component} & \textbf{Percentage} & \textbf{Angle(°)} \\
\hline
Direct Tax & 25 & 90 \\
Indirect and other & 32 & 115.2 \\
Non-tax revenue & 13 & 46.8 \\
Non-debt capital & 6 & 21.6 \\
\hline
\end{tabular}
(a) Mean is the average of a given distribution. It is affected by end values (it highly skewed, mean may deviate from centre).

Median represents the point in frequency for which 50% of frequency distribution lies above and 50% below this value when arranged in increasing/decreasing order.

Mode is the value in distribution having maximum frequency.

If Median = 20.6,

Mode = 26,

Mean will be between 20.6 and 26.

5 sigma accuracy is used in regression analysis to determine accuracy of curve over a distribution.

It was recently in news for Higgs Boson discovery was given with probability in sigma scale.
Quantiles represent the point at which 25% of distribution lies below the value.

<table>
<thead>
<tr>
<th>Expenditure (Rs.)</th>
<th>Families</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>0 - 10</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>10 - 20</td>
<td>12</td>
<td>26</td>
</tr>
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<td>20 - 30</td>
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<td>30 - 40</td>
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<td>71</td>
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<td>40 - 50</td>
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<td>86</td>
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Bottom 25% of frequency = 21.5.
Thus, lies in range [10 - 20].

Quantile = 10 + \((21.5 - 14) \times 10\)
= 16.25