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SURE SHOT MAINS CAMP - 2025

General Studies FLT - 1 Test - 3 GS - 3	Evaluator Code: Date of Assignment: CQ:
---------------------------------------------------------	-----------------------------------------------

NAME:	ASEEM MAHASAN	Time allowed: 3 Hours
STUDENT ID.:	25UR99191	Email: <input type="text"/>
UPSC ROLL NO.:	2500549	Submission Date: 30-07-25
MOBILE NO.:	<input type="text"/>	

QUESTION PAPER SPECIFIC INSTRUCTIONS

Please read each of the following instructions carefully before attempting questions:

There are **TWENTY** questions printed in **ENGLISH**. All the questions are compulsory.

The number of marks carried by a question/ part is indicated against it. Word limit in questions, wherever specified, should be adhered to. Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

Q No.	Marks	Q No.	Marks	Q No.	Marks
Q1	/10	Q8	/10	Q15	/15
Q2	/10	Q9	/10	Q16	/15
Q3	/10	Q10	/10	Q17	/15
Q4	/10	Q11	/15	Q18	/15
Q5	/10	Q12	/15	Q19	/15
Q6	/10	Q13	/15	Q20	/15
Q7	/10	Q14	/15	Total	/250

Instructions:-

- Legible Scanning:** Exercise due diligence in scanning your scripts for clear legibility
- Submissions** marred by poor scanning, notably those with illegible sections or blackened pages due to improper scanning, risk being excluded from the evaluation process.
- Non-Adherence Consequences:** Failure to comply with the aforementioned instructions may lead to the disqualification of your submission.

For Student Only

Start Time - 12:00pm	End Time - 3:05pm
Mode of Examination	Online <input type="checkbox"/> Offline <input checked="" type="checkbox"/>
Receiving date -	Dispatch date -

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Parameters		Good	Average	Needs Improvement
Conceptual Understanding				
Understanding Demand of Question				
Structure	Introduction			
	Body			
	Conclusion			
Presentation-Illustrations, flowcharts, diagrams, etc.				
Language and Handwriting				
No. of Questions Attempted				
Adherence to Word Limit: Yes/No				

Mentor's Feedback

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Evaluator/Reviewer Suggestions



Evaluator/Reviewer Suggestions



(Answer questions in NOT MORE than the word limit specified for each in the parenthesis. Content of the answer is more important than its length.)

1. GDP estimation in India faces concerns over outdated methods and data gaps. Examine the methodology adopted to compute GDP in the country and suggest improvements. (10 marks / 150 words)

India ^{is considering} ~~is~~ is considering a major change in GDP estimation lately by shifting its base year from 2011-12 to 2022-23, bringing to light ~~to~~ the cracks in India's existing GDP enumeration -

Methodology adopted to compute GDP in India

For ^{GVA} ~~GDP~~ BP

→ Value of goods/^{services} - Intermediate Consumption

→ Base Price = Factor Cost + Production taxes

For GDP MP, 3 main methods:

- ① Income method - Total of all incomes in the country
- ② Value added method - Value of goods/services - Intermediate consumption

③ Expenditure method :- Consumption + Investment + Government Expenditure + (Export - Import)

Concerns in GDP calculation

Suggested solutions

① Outdated base year - 2011-12 → Creates base effect

① Regular updation of base year

② ^{Most} ~~95%~~ of economy is informal → Not counted

② Exclusion of sectors by measures like E-Shram

③ lag in reporting → Estimates come out months later

③ Use of digital tech for immediate estimates

④ Does not account for externalities

④ Best practices → Use of green GDP by Haryana

India's sectoral growth is better tracked by GVA_{BP}, leading to its more extensive use compared to GDP_{MP}

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2. Explain the concept of the "Missing Middle" in India's industrial ecosystem. How does it affect economic growth and employment generation?

(10 marks / 150 words)

India's industrial ecosystem has not experienced the level of growth seen in other emerging economies like China, and is limited to 17-18% GDP since liberalisation

What is missing middle

→ When a sector is skipped in the growth stage for the next step.

→ In India, services sector overlooks industries in boom after liberalisation

Effect on

Economic growth

- ① Reduced pace compared to China as hub of manufacturing
- ② Stagnant industrial ~~economic~~ sector ↴

CAGR is 3-4% p.o.

③ Lack of utilisation of cheap labour:

Missing out on competitive edge.

④ Import dependence \Rightarrow Most of toys in India come from China

On Employment generation.

⑤ Less employment elasticity \Rightarrow

0.1

⑥ Limited in service sector as it needs high level of skill.

⑦ Agricultural under employment

Still employs 45% of population as industry has little opportunity

Solutions

- \rightarrow National manufacturing policy
- \rightarrow Skill and Play Infr
- \rightarrow PFI schemes

India has recently emerged as the hub of toy making showing potential of its manufacturing sector

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3. The 2025 Economic Survey has highlighted deregulation as a tool for financial deepening. In this context, enumerate the potential benefits and risks of deregulation in the financial services sector.
(10 marks / 150 words)

Financial services sector covers all services ranging from banking to online courses, peer to peer lending, credit ratings, etc -

Benefits of deregulation

- ① Reduced fund cost \Rightarrow Operating as a digital payments bank as of now needs minimum 100 Cr corpus
- ② Failures of regulation \Rightarrow Yes bank failure, twin balance sheet syndrome, etc.
- ③ Emerging digital age - Deregulation stops use of new tech like blockchain
- ④ Globalisation of financial markets renders regulation moot \Rightarrow Use of crypto-currency in India

Risks of deregulation

- ① Increased financial frauds Eg Seen in Peer to peer lending
- ② Necessity for fair evaluation Eg Credit ratings needed for sensible fund disbursal
- ③ Improvements in banking Eg NPA's down to 1.3%
- ④ Positive regulations Eg National Financial Literacy Strategy - RBI
- ⑤ Protecting consumer interest Eg SEBI's efforts to stop Jane Street manipulation
- ⑥ Successes of policy Eg Digital Banking units of traditional banks

Subhash Chandra Committee has recommended Reg Tech - or use of AI and new age tech based regulation for emerging sectors

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4. What is carbon farming? Explain its role in sustainable agriculture and climate change mitigation. Discuss the key practices involved.

(10 marks / 150 words)

Carbon farming is the use of farming practices that lead to increased carbon sequestration in land unlike traditional extensive agriculture

Key practices involved

- ① Use of natural resources
↳ Vermicompost, cowdung for fertilisers.
- ② Reduced tillage → Methods like no tillage and strip agro-forestry are used
- ③ Region specific practices ↳
Growing millet in dry regions of Karnataka and Rajasthan
- ④ Adoption of local knowledge
↳ Sub-surface porous vessels in Jaisalmer

Role in Sustainable agriculture

① Economically

- Reduced expenditure on fertilisers
- Can sell carbon credits (Carbon Credits Scheme, 2023)

② Access → Local orphan Crops like Millet, suckewheat, etc. get stimulus

③ Sustainability Eg → Extensive agriculture has led to soil salinity in Haryana

④ New Market access Eg → Organic ~~crop~~ crops are becoming an emerging market

⑤ Use of traditional wastelands

Eg → Dryland agroforestry → Sunderban
Urmie

⑥ Use of local knowledge Eg → Sulbhash Dalakar's 2NBF

India can capitalise on global markets for carbon to make carbon farming economically viable in India

Introduction

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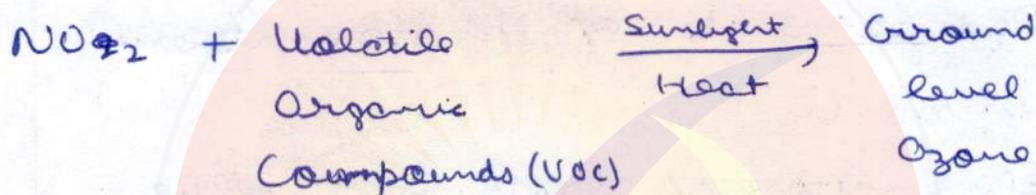
Marks:

5. What is ground-level ozone pollution? How is it formed, and what are its effects on human health and the environment?

(10 marks / 150 words)

Ozone is a necessary gas in the troposphere to prevent UV rays from reaching the surface, but at ground level it becomes a pollutant.

Formation of ground level ozone



Sources are -

- ① vehicular exhausts - produce VOC's needed for ozone.
- ② Local burning of fossil fuels
- ③ Steel and aluminum processing factories.
- ④ Public transport

Effects

Human health

- ① Burning of lungs and lung lining

- ② Reddening of eyes + Swollen eyes
- ③ Irritant for asthma patients
- ④ Retardation in infants
- ⑤ COPD issues in young adults

Environment

- ⑥ Reduced usability due to mixing with smog \rightarrow LA Smog
- ⑦ Reduced rate of photosynthesis in plants.
- ⑧ Elimination of biota like blue-green algae

Solutions

- \rightarrow Greening of public transport
- \rightarrow Transit oriented development model \rightarrow Tamil Nadu
- \rightarrow Walkable cities \rightarrow Bengaluru city plan
- \rightarrow Catalytic converters mandatory

India can follow the Beijing Action Plan as a best practice for city oriented solutions

Introduction	
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Marks:	

6. Explain the structural and operational limitations of the Disaster Management Act, 2005. How far does the 2025 Amendment address these deficiencies through a shift towards anticipatory and technology-driven disaster governance? (10 marks / 150 words)

The disaster Management act, 2005 established the NDRF and SDRF and created the Centre and state disaster management funds, but the act has various limitations.

Limitations of DM act, 2005

Structural

- ① Misuse of 7th Schedule - Created under Entry of Social Insurance and Social Protection
- ② Lack of federal structure - Major decisions exclusively taken by centre
- ③ Focus on response, not mitigation
↳ Mitigation funds are heavily limited.

Operational

- ④ Many major disasters not covered
↳ Heat waves are not covered

as disaster in the list.

- ⑤ NDRF failure :- ~~Eg~~ Criticised for late response in 2013 Kedarnath floods
- ⑥ Plans by NEC, not by NDRF, who implements them
- ⑦ Absence of experts

Addressing of deficiencies by 2015 amendment

- ① Experts to be included in NDRF and SDRF
- ② Plans to be made by NDRF instead of NEC
- ③ Refocus on disaster mitigation funds.
- ④ Integrated Control Room for disaster management (ICR-DM) - Online
- ⑤ ~~and~~ Integrated list of all disasters of a region
- ⑥ Urban disaster management authorities for major cities

Top finance commission has allocated 50 000 Cr to Disaster management to supplement efforts of centre

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Marks:	

7. Nanotechnology represents a paradigm shift from 'bigger is better' to 'smaller is smarter'. In this context, examine the transformative potential of nanotechnology in the fulfilment of India's environmental goals. (10 marks / 150 words)

'There is always room at the bottom'

The above mentioned paper showed how nanotech breaks the general concept of bigger is better in the 1960s, leading to a nanotech revolution

Bigger is better $\xrightarrow{\text{shift to}}$ Smaller is smarter

① Huge water purification plants \rightarrow Use of silver coated nano-filtration systems

② Huge spying apparatus \rightarrow China has just demonstrated a nano-drover

③ Bigger metals like steel = More strength \rightarrow Focus on nano-structures like Carbon and C-60

Potential of nanotech in India's environmental goals

- ① In waste processing - Nanobots being used to decompose non-biodegradable waste.
- ② Carbon sequestration - Nano tech used for GM modified trees with more carbon intake
- ③ Clean energy - Microorganisms decompose household waste into biomass
- ④ Curbing pollutants \Rightarrow Use of nano fillers in coal plants.
- ⑤ New Energy sources \Rightarrow Stage IV of biofuels uses nano tech for development of high energy microorganisms.

India's Nanotech mission needs urgent funding beyond the mandated corpus as an emerging sunrise sector

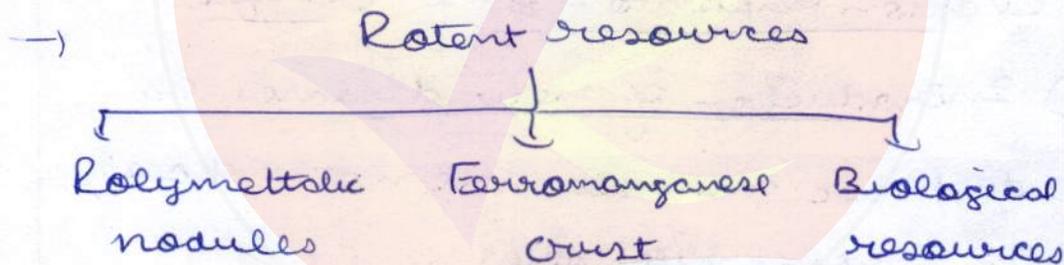
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8. Define deep-sea mining and briefly explain how it can result in long-lasting changes to the seabed ecosystem. (10 marks / 150 words)

India deep sea mission has deep sea mining as one of its crucial objectives, for which India has leased 75000 sq. km in the Central Indian Ocean region from the International Seabed Authority

What is seabed mining

→ Use of automated deep diving tech to extract resources from the base of ocean



→ Methods of extraction

a) Reefing - Primarily for nodules

b) Physical extraction :- Use deep sea excavators

c) Pipelines to mine ~~and~~ floating resources

d) Use of submersibles

Long Lasting Changes to Seabed ecosystem

- ① Physical disruption ~ Deep sea mining causes plumes of silt to spread out.
- ② Disruption of habitat \Rightarrow Environmangores
Crust is used for egg-laying by many animals
- ③ Disturbance in substratum \rightarrow Home to many crustaceans, insects, etc.
- ④ Disruption of particular areas \Rightarrow
Most resources concentrated in Clarion Clipperton zone (Pacific)
- ⑤ Introduction of new diseases as deep sea animals are not exposed to surface microbes
- ⑥ Lack of data as to the long term impact of such mining

The high seas treaty under UNCLOS

aims to mandate EIA of every such project to minimize ^{disruption} ~~disturbance~~ to ecology

Introduction	
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9. What is 'Indirect Prompt Injection' in the context of AI chatbots? Examine its potential impact on the reliability of digital assistants and the privacy of end users. (10 marks / 150 words)

Indirect prompt injection means asking a question to AI indirectly which it is not willing to answer directly.

Example

How to make a bomb

↳ AI refuses to answer

Ingredients of a bomb

↳ AI will answer, then you can continue

Impact

Reliability of digital assistants

- ① Can lead to disruption in society
- ② Use for malicious methods
- ③ Innocent answers → Given by

Critic when asked about reason

Privacy of users

- ④ Data about users can be extracted
- ⑤ Algorithmic biases can be created.
- ⑥ Faulty decision making

Solutions

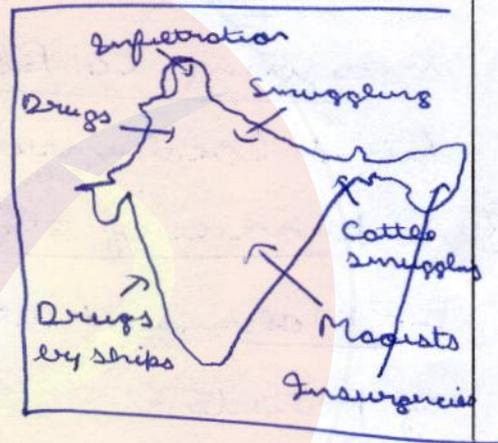
- Best practices - AI act of EU
- Ending black box syndrome:
 - Open source model
- Funding domestic projects
 - AI Kosh of India

10. "Internal security challenges in India are increasingly shaped by external and transnational dynamics." Examine the statement with relevant examples.

(10 marks / 150 words)

The recent Pahalgam attacks in Jammu & Kashmir presented a grim picture of how India's ^{internal} security challenges have been internationalised and no more merely domestic.

How Internal security challenges are shaped by external dynamics



- ① As sponsors :- Eg Direct links of noxxites to Chinese agencies have been unearthed
- ② As weapons suppliers Eg Mizo militant groups often get their weapons from Myanmar
- ③ As safe havens :- Pahalgam attackers hid in Pakistan after the attack
- ④ As narco-terrorism has increased Eg Increased

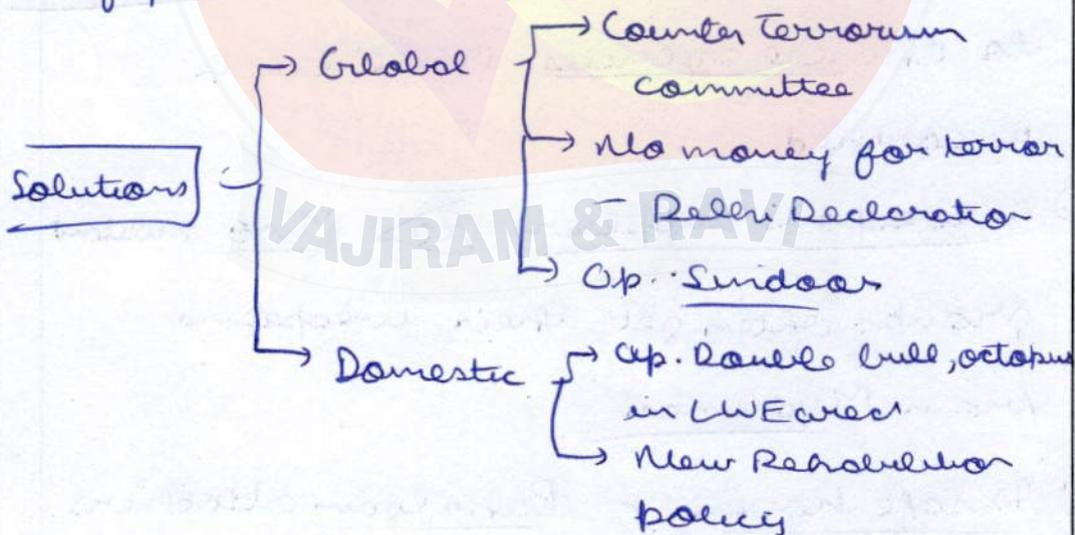
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drug intake in JNPT directly linked to golden crescent

⑤ Neighbourhood instability = increased security challenges Eg → Rise in Islamic militancy in Bangladesh after fall of Sheikh Hasina

⑥ As markets Eg → Revenue from cattle smuggling to Bangladesh used to fund local insurgencies

⑦ As proxies of other states - Tajik - E-Mohammad acts as a proxy of Pakistan



Madhuban Gupta Committee recommended heavy use of tech on unmanned borders to end this trans-national nexus

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11. What are the structural causes and macroeconomic implications of the persistent depreciation of the Indian rupee? Suggest measures to ensure exchange rate stability without compromising economic growth.

(15 marks / 250 words)

The Indian rupee has recently breached the $\text{₹ } 85 = 1 \$$ psychological mark, seeing a close to 20% dip in the last 10 years

Structural Causes of depreciation

Ⓐ Domestic

- ① Managed floating by RBI :- Lets rupee depreciate when there are outflows but uses inflows to build up reserves
- ② Small export presence :- India has only 2.1% share of the global markets.
- ③ Domestic inflation :- $\text{④ } 4\% +$ for 4 quarters \Rightarrow More demand for imports \Rightarrow Depreciating rupee
- ④ Fiscal deficit fears :- Ballooned to 9.3% in 2021, \rightarrow Jittery investors

International

- ⑤ Global war clouds / Investors pull out money from risky markets like India.
- ⑥ Tariff wars - Trump's threatened tariffs reduce demand for Indian goods
- ⑦ Indian exports demand ↓ in US due to their purported recession

Macroeconomic Implications

+ves	-ve
① <u>For exporters</u> :- As they will get more return for sales	① <u>Importers</u> - More expense
② <u>For service sector</u> :- Increased remuneration as majorly serves foreign markets	② <u>Inflation</u> :- ↑ due to rising import cost.
③ <u>For lenders</u> from <u>international market</u> :- Eg Investment in US shares will get better returns	③ <u>RBI</u> :- <u>Weakening of inflation targeting agenda</u>
	④ <u>Govt</u> :- <u>Reduced fiscal space for capital imports</u>

Measures to ensure exchange rate stability w/o hampering economic growth

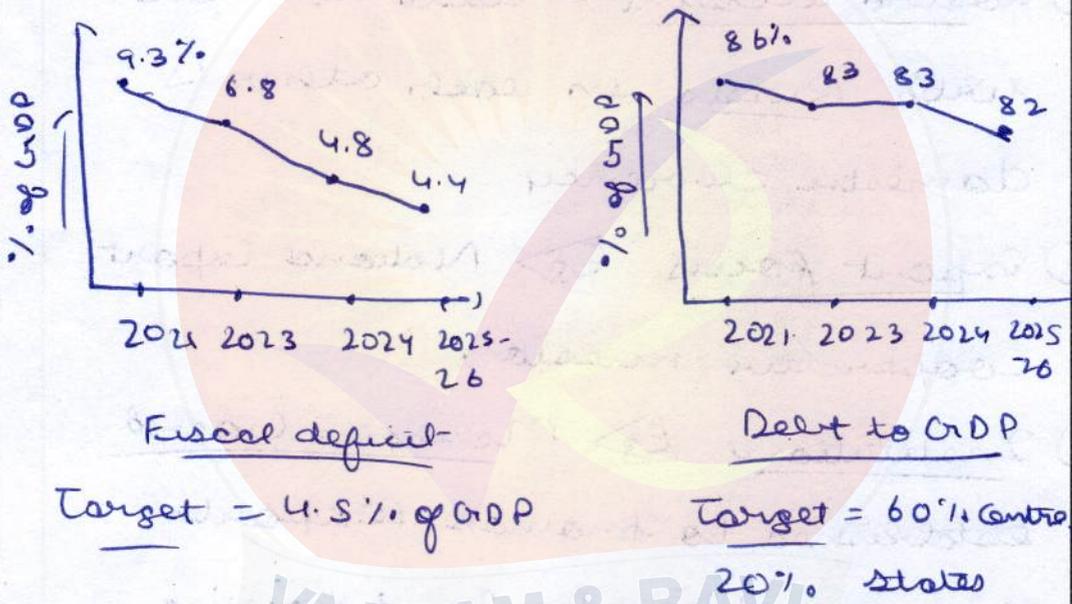
- ① RBI operations Eg) Regulated sale of dollars in the international market
- ② Currency swap agreements :- Eg) with Sri Lanka
- ③ Uostro account :- Used to trade with Russia in each other's domestic currency
- ④ Export focus Eg) National Export Cooperative mission
- ⑤ Institutions Eg) Moskova based established to promote exports
- ⑥ Strengthen domestic fund raising
Eg) Expanding bond markets

India has built up a sizeable forex reserve of over 600 billion \$ in anticipation of the oncoming currency instabilities in the world

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12. A shift from fiscal deficit targeting to debt-to-GDP ratio as the fiscal anchor signals a more holistic approach to fiscal discipline. Do you agree? Give reasons in support of your arguments. (15 marks / 250 words)

Recently the RBI governor has commented on the need for a shift from N.K. Singh recommended fiscal deficit targets towards debt to GDP ratio for a more holistic approach to finances



Now Debt - GDP ratio anchor is a more holistic approach

- ① Used by international credit agencies in giving credit ratings.
- ② Signals long term trends in Fiscal

- deficit is merely an yearly concept
- ③ More accepted globally \Rightarrow US relies on debt to GDP ratio.
 - ④ Determines interest liability of the state in total.
 - ⑤ Signals trends \Rightarrow If debt-GDP ratio is rising very fast, it means growth is not keeping up with development.
 - ⑥ Federal inclusion :- Debt-GDP usually reflects debts by state as well.
 - ⑦ Leaves fiscal space for yearly contingencies such as crisis during COVID-19.
 - ⑧ Enables yearly deviations by keeping an eye on the long term growth.
 - ⑨ Growth stimulus :- \Rightarrow Justified fiscal deficit in case of Capital

expenditure.

HOWEVER

- Can lead to increase in populist policies
 - Moral hazard of allowing fiscal deficit to run free
 - Ignoring short term goals can lead to debt getting out of hand
- ⇒ US has reached a debt of 15 trillion \$ due to focus on deficit financing

There can be a revisiting of NK Singh formula to ensure that both variables get equal weightage in decisions related to fiscal prudence

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13. Do you agree that granting a legal guarantee to Minimum Support Price (MSP) may create a fiscally unsustainable and economically inefficient agricultural system? Suggest viable alternatives to ensure fair farmer remuneration without distorting the market. (15 marks / 250 words)

'MSP is insurance, not remuneration'

- MS Swaminathan

The recent farm protests (2021-23) were based around the demand for a legal guarantee for MSP, currently guaranteed via an executive order, but this can lead to systemic inefficiencies

Downsides of MSP legal guarantee

Fiscally unsustainable

- ① Strain on fiscal deficit targets - 4.5% limit set by N.K. Singh
- ② Reduced space for agri research expense - Currently only 1% of Agri GDP
- ③ Benefit only to a few - MSP serves only around 6% of farmers (Shanta Kumar Committee)
- ④ Revenue expense \Rightarrow No asset created
- ⑤ Already existing fiscal burden - 2% of GDP on agri subsidies

Economically inefficient

- ⑥ Wheat-rice monocycle further perpetuated
- ⑦ Unbalanced regional development - Most MSP beneficiaries are in Rajasthan, Haryana, West UP
- ⑧ Lack of export orientation Eg Local crops meant for export like Molts in Rajasthan replaced by rice
- ⑨ DISCOM burdens - Due to high water demand of rice and free electricity to farmers
- ⑩ Shift from market led to policy led approach
- ⑪ Procurement inefficiencies Eg 62000 tons wasted in FCI godowns (Min. of Agriculture, 2021)

Viable alternatives for fair remuneration

- ① Increase 'Green box' subsidies under Agreement on Agriculture - Eg PM-KISAN

(Don't write anything in this part)

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② POPS systems :- Farmers get paid the ~~larger~~ difference between target price and market price

↳ Bhavantar Bhugtan Yojana (MP)

③ Private MSP procurement scheme :-

Private players allowed to procure at MSP rates. → Used as pilot in several states.

④ Need based interventions

↳ Market stabilisation scheme :-

Government only intervenes when there is a 10%+ drop or rise in crops to prevent distress sale by farmers

These measures need to be substituted by village level procurement (NITI) and building storage capacities to bring the evergreen revolution envisioned by M.S. Swaminathan

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14. The future of food security in India depends on recognising and integrating women farmers into formal agri-value chains. How can gender-responsive budgeting and SHGs help mainstream women farmers into India's agri-value chains?

(15 marks / 250 words)

73.2% of rural women are involved in agriculture, yet only 12.8% own land and only 20% receive formal financing (Agri Census) which shows the exclusion of women farmers from agri-value chains

Food security $\xrightarrow{\text{linked to}}$ women informal agri value chains

① More productivity \rightarrow women are the bulk of agri labour
Integrating women -
More incentives

② Increased accessibility \rightarrow Understand specific needs like child malnutrition better

③ Increased access \rightarrow Feminisation of agriculture needs specific targeting of this sector

Role of various measures in mainstreaming women in agri value chains

Gender-responsive budgeting

① Targeting gender specific problems

↳ 30% funds in Sub Mission for agri-mechanisation for women

↓

Targets specific problem

SUCMAS

Traction design
making it unusable for women

② Addressing gender specific needs

↳ 30% in National food security mission
To target gender specific issues like anaemia-prevalence

③ Increased fund flow

Gender budget → 6.8% (2022) → 8.8% (2025)

④ Gender specific missions

↳ National Millet mission
specifically targeting women

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Role of SHCs

- ⑤ New employment opportunities
↳ Drones for SHC women.
- ⑥ Marketing opportunities
↳ Sanchays for SHC goods marketing
- ⑦ Addressing intersectional exclusion
↳ Moaranga → Tribal Women SHC for sale of tribal products.
- ⑧ Increased formalisation
↳ 'Safe n' fresh' branding by Jammu SHC
- ⑨ Increased income
↳ Lakshmi SHC women scheme
- ⑩ Increased resource access → Due to SHC-Bank linkage project (NABARD)

The UN has declared 2026 as the 'year of the woman farmer' to recognise gender's role in enhancing our food security.

Introduction

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Marks:

15. "India's research and development ecosystem lacks the scale, coordination, and investment needed to drive innovation-led growth." In this context, examine the major challenges facing R&D in India and suggest key reforms to make it globally competitive. (15 marks / 250 words)

The Recent Amarendraan National Research foundation (ANRF) acknowledges the lag in R and D in India, which is at 0.6-0.7% of GDP, compared to benchmarks like China at 4%.

Lack in India's R and D

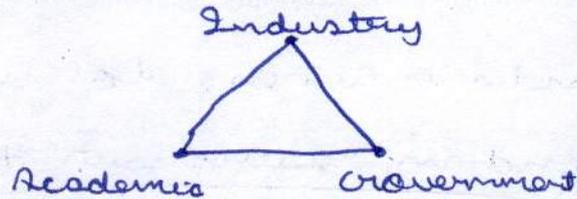
- Scale
 - No major research facilities at state level
 - Projects often remain theory bound → Never practically used
- Coordination
 - Absence of ~~public~~ ^{industry} - academia collaboration
 - Lack of Private + Public Collaboration
- Investment
 - 67% comes from the public sector
 - Almost entirely dominated by institutions like IIT's and IISc's

Challenges for R and D in India

- ① Fragmented institutions \rightarrow PSA, ministry of science and tech, etc. works in silos
- ② Foreign dependence \rightarrow LCA taxis made in house \rightarrow But engine developed by general electric.
- ③ Lack of critical minerals \rightarrow 58% of world's lithium held by China
- ④ High barriers to entry \rightarrow Semiconductors research needs upwards of 1 bil \$ investment.
- ⑤ Weak patent regime :- 83000 in 2025 compared to 6 lakhs by China
- ⑥ Lack of professionals :- \rightarrow CIETAC is not headed by a biotech professional.
- ⑦ Fake research \rightarrow Maximum world's fake journals are published in India

Key reforms to make it globally competitive

- ① Triples helix model



NRF is trying to achieve this

- ② Increased GDP share to 2% from current 0.6-0.7%
- ③ IPR promotion \rightarrow KAPIL scheme.
- ④ Brain Gain \rightarrow VAJRA scheme to invite PIO's to collaborate with Indian institutions
- ⑤ Tech transfer to be mandatory in foreign deals like infotech purchases
- ⑥ Professionals as heads of institutions
 \rightarrow ISRO model
Leadership of Indians in silicon valley tech shows that there is a ready base of Indians willing to be tapped.

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16. Discuss the primary objectives of India's Gaganyaan mission. Analyse its potential impacts on India's space exploration and scientific capabilities. What are the key challenges associated with this mission? (15 marks / 250 words)

India is aiming to indigenously send an astronaut to space by next year via the Gaganyaan mission, and recently sent Sudhanshu Shukla to space on a private Axiom-4 mission as a first step towards the goal.

Primary Objectives of Gaganyaan

- ① Independent human spaceflight to low earth orbit
- ② Sustaining human habitation in LEO for a set period
- ③ Safe re-entry after the mission period is over.
- ④ Ability to create habitable atmosphere under hostile space conditions.
- ⑤ Sending 3 astronauts → Preferably 1 female - To orbit

Impacts on

Space exploration

- ① Enables future projects like Bharatya Antariksh Station
- ② Ensures tech for planned mission to moon by 2035
- ③ Essential step in Interplanetary travel → Elon Musk's colonisation of Mars plan.

Scientific capabilities

- ④ LMU3 engine tech demonstration
- ⑤ Successful testing of CE-20 engine.
- ⑥ Gyroscopic tech being successfully deployed → Dual use for ballistic and hypersonic missiles
- ⑦ Demonstrating sustainable space travel → Indian Engines use liquid peroxide instead of hydrogen
- ⑧ Uyemmitra : Successful use of robots

Key Challenges

- ① First test for GE-20 mission and its capabilities
- ② Harsh space environment
- ③ Risk of solar flares and coronal mass ejections
- ④ Moral hazard - Spending millions on a project while socio-economic goals of country not achieved
- ⑤ Health impact on astronauts due to space stay → Sherubenshu Stubbs lost 5% of muscle mass

India aims to capture 10% of the space market by 2030, and Cragman would be a potent first step in capturing the emerging space tourism industry

Introduction

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Marks:

17. Evaluate India's institutional mechanisms for responding to nuclear emergencies. Propose a strategic framework for disaster risk reduction, incorporating global best practices and IAEA guidelines. (15 marks / 250 words)

Two ~~for~~ Chernobyl, Nine Mile Island and Fukushima Disasters have made the world aware of the dangers of nuclear tech and its potent hazards, necessitating frameworks for nuclear emergencies.

India's institutional mechanisms for nuclear emergencies

- ① Department of Atomic Energy :-
Directly under PMO → Directs 3 stage program
- ② Nuclear liability act, 2010 :- No fault liability of operators + of suppliers if disaster is caused by part errors
- ③ Public liability insurance act, 1991 :-
For compensation to employees in case of emergency
- ④ No fault liability concept by judiciary →

Instituted in Indian Council for enviro legal action case

⑤ No automatic FDI ; Only government ~~Successes~~
route investment

⑥ NSG waiver for civil nuclear tech

⑦ Access to IAEA to civil nuclear plants of India for safety evaluation of plants.

⑧ Small modular reactor policy
Successes

Failures

① No major nuclear disasters in India yet

① Kudankulam plant cyber attack

② Liability of suppliers and operators

② Liability only upto 1500 Cr

③ Located in remote areas Eg No nuclear plants in north India

③ Absolute liability clause keeps away most international firms

④ SMR's will be remotely located and create less waste

④ Stuck on Stage-I of India's 3 stage program

⑤ Still only 2% of energy

Strategic framework for disaster risk reduction

① Prevention

→ China has started 1st thorium based plant → Much safer than plutonium plants.

② Early Warning system

→ Japan - Regional warnings as soon as any anomaly detected -

③ Capacity building

→ IAEA - Drills for awareness in case of nuclear meltdown → what not to do guidelines

④ Surveillance

→ IAEA regularly monitors all civil nuclear plants

⑤ Disaster Response → Training of NDRF for disasters

Fukushima saw great participation of civil society in mitigation, thus capacity building of citizenry is very crucial for such disasters

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18. Marine plastic pollution poses a significant threat to biodiversity and coastal ecosystems. Discuss the various mitigation measures to deal with this problem, and also international initiatives in this regard. (15 marks / 250 words)

Recently an expansion has been seen in the Great Pacific Garbage Patch, a kms wide plastic collection in the middle of eastern Pacific, emblematic of various risks of marine plastic pollution.

Threats to

Biodiversity

- ① Choking hazard - Marine birds often die due to this
- ② Reduces eggshell thickness = Decreased numbers of offsprings.
- ③ Endangers mid ocean rare species
Eg) Sperm whales in that region
- ④ Harm to plankton - No plastic acts as barrier to sunlight

Coastal ecosystem

- ⑤ To beaches - Pollution leads to reduced

Cultural value

- ⑥ To breeding grounds \Rightarrow Open ridley spaces littered with plastic in Cromwellia wildlife sanctuary
- ⑦ To corals ; \Rightarrow Marine pollution leads to coral bleaching events
- ⑧ To nutrient cycles \Rightarrow Hampers access of animals to estuaries

Mitigation measures

- ① Reduction in plastic generation
 - > Banning single use plastic
 - > Replacement with eco-friendly options like Jute.
 - Intl. initiatives - Plastic pact, Un-Plastic Collective.
- ② Prevention of marine dumping
 - > Processing on land via incinerators + Waste to Energy projects
 - Intl. initiatives - MARPOL regulation

• Biodiversity beyond high seas treaty - (BBNJ)

③ Collecting existing plastic waste

→ Role of NCRs like Bombay Natural History Museum

→ Inte. Initiatives : Italy's Plastic Beach Cleaning Initiative

④ Special regulation for coastal ecosystems

→ CRZ's, Integrated Coastal zone mapping

→ Inte. initiatives : Blue flag certification for beaches

⑤ Setting responsibilities

→ Inte. initiatives : Loss and damage fund

Innovative technologies like use of algae and other microorganisms that help plastic decay can be taken beyond the pilot stage

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19. In light of evolving national security threats, how do the New Criminal Laws address modern threats like cybercrime and organized crime? Outline the challenges perceived in its effective implementation.

(15 marks / 250 words)

As per the World Bank, cybercrimes have gone up by 400% since COVID, and the recent uncovering of organised crime gangs in Vietnam using Indian slaves for cybercrimes show how both are on the rise.

Addressed by New Criminal Laws

Cybercrime

① By Bharatiya Nyaya Samhita

a) Objective territorial jurisdiction

↳ If criminal is outside India, even then Indian courts have jurisdiction.

b) Inclusion of financial crimes

↳ Use of fake currency to conduct a crime

② By Bharatiya Nyaya Sakshya Samhita

a) Forensic investigation made

mandatory in many crimes → Needed in cybercrimes

b) Investigation by an IO himself → Court delegates the duty

③ By BSS

a) Evidence can be presented in electronic form

Organised crime

① By BNS

a) S.111 :- Communes organised crime as a separate offence

b) S.112 :- Communes petty organised crime → Crimes that leak escams

c) Being a member of such an organisation is also a crime.

② By BNSS

a) Video recording of all crime scenes

b) Can conduct trials in absentia

c) No bail if there are multiple charges subsisting against a convict

Challenges in effective implementation

Cybercrime

- ① Often conducted from outside state.
- ② Non traceable in many cases
- ③ New forms keep emerging Eg Digital crimes
- ④ Lack of infrastructure to deal with complicated offences
- ⑤ Use of dark web

Organised crime

- ① Tough to prove existence of organisation
- ② Inter-country presence.
- ③ Continued operation after imprisonment
- ④ Lagged situation of jails

Way forward

Cybercrime → Strengthen CERT
 → Awareness in people
 → Financial literacy

Organised crime → Stronger Extradition treaties
 → Modernisation of prisons

The new acts are a solid framework but need to be backed with strong institutional measures

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20. What do you understand about GPS/GNSS spoofing? Discuss its implications on critical infrastructure and civilian security in India. Suggest robust policy and technological measures to mitigate its impact.

(15 marks / 250 words)

GPS/GNSS spoofing is using technology to present your location as somewhere different from where you actually are

Tools for GPS spoofing

- UPN's
- Fake IP addresses
- Independent Internet service providers
 - ↳ Starlink
- Mule accounts
- Dark web

Implications on Critical infrastructure

- ① Hacking vulnerability - By faking location of an authenticated login.
- ② Threat of ransomwares - Ex on

Balance pipeline in US in 2016

③ Navigation threats to fishing and airlines which extensively use GPS.

④ Threat to guidance systems of defence systems which are GPS reliant.

On Civilian security

⑤ Evilulent transactions by faking India as location.

⑥ Financed crimes

⑦ Threat to safety of 2 factor authentication in Emails as it relies on GPS data of logs.

⑧ Increased use of dark web and thus access to illegal goods and content.

Measures to mitigate impact

Policy

- ① National Security Doctrine to be public.
- ② More funding to NCIIPC under IT act.
- ③ Passing the new IT act.
- ④ Regulation of VPN providers in India.

Technological

- ⑤ Development of NAVIC to reduce reliance on GPS.
- ⑥ Advanced signal tracing
- ⑦ Use of quantum satellites for secure communication → ITI Delhi has recently demonstrated

The global convention on cyberspace needs to emerge as an effective tool to counter new and emerging cyberspaces

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Marks:

Space for Rough Work



Space for Rough Work

