THEORY EXAMINATION-APRIL 2022		TIME – 4 Hrs.
M.TECH – Defence Technology	**SEMESTER – I**	**M.M. - 60**

PAPER - DT-01-02	SUBJECT - Warfare Simulations & Strategies

INSTRUCTIONS TO BE FOLLOWED

- The questions are to be considered as they are printed. In case of any doubt, make relevant assumptions and mention the assumptions in your answer.
- Answers expected are your views and understanding and not necessarily what is taught in the class.
- Originality in giving answers will be given extra importance while marking.
- This is an NOT an examination of memorizing ability or your ability to search on internet. We are looking for original thinking about defence problems.

Attempt a minimum of 5 Questions.

Q. 1 (Part-A) need you to answer at least four out of six parts. Question 1 is of maximum 16 marks. If you attempt more than 4 parts from question 1, each part will be evaluated but the marks will be awarded to the best of 4 parts from question 1. Each part has a maximum of 4 marks.

Part-B. has 6 Questions (Q.2 to Q.7). You need to answer at least 4 out of 6 questions. If you attempt more than 4 questions, all attempted questions will be evaluated. However, the final marks will be given to the best of 4 attempted questions. Each question has a maximum of 11 marks.

- **Allotted time for examination is 4 hours that includes time for downloading the question paper, writing answers, scanning of answer sheets and uploading the sheets on the Attendance Sheet Cum Answer Sheet Uploading google form.**
- **The PDF files should be saved as Roll No. and Subject Code.**
- **Maximum Page Limit should be 36 (Thirty Six) for attempting the question paper on A4 sheets which could be downloaded and printed from the sample sheets given in the UIET Website.**
- **Over-attemptation should be avoided.**
- **Handwriting should be neat and clean and diagrams should be clear and contrasted.**
- **The candidate should not write their Mobile No. otherwise Unfair Means Case will be made.**
- **While attempting the paper, the candidate will use blue/black pen only.**
- **Before attempting the paper, the candidate will ensure that he/she has downloaded the correct question paper. No complaint for attempting wrong question paper by the candidate will be entertained.**
- **Candidate must ensure that he/she has put his/her signature on each page of the answer sheet used by him/her. Answer sheet without the signature of the candidate will not be evaluated.**
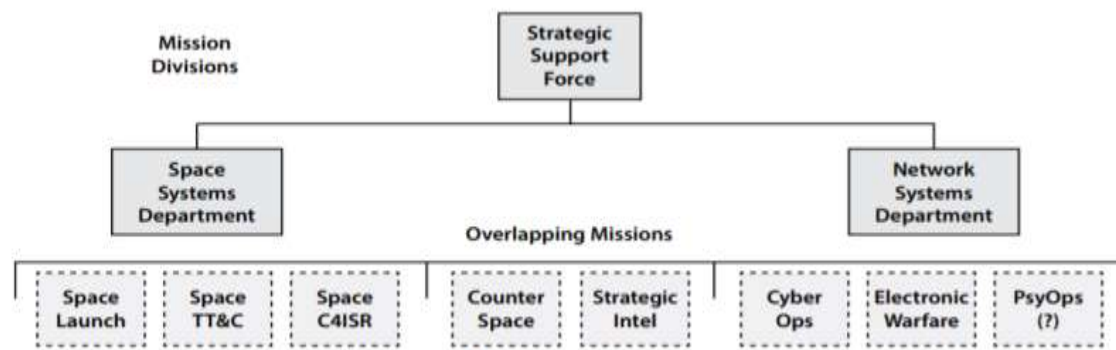
Q. No. 1 Answer any 4 of following questions (Objective/Short Answer Type Questions) Total Marks 16

(i)	Define War in your own words.
(ii)	If you are asked to teach the next batch of Warfare Simulations and Strategies course, how will you design and teach the course?
(iii)	Critically evaluate the statement "measurement of any weapon system effectiveness in future battlefields is difficult if not impossible" in the perspective of rapidly changing future war.
(iv)	In Epstein's Adaptive Dynamic Model of combat, The ground-induced exchange ratio is given by $$\rho(t) = \rho_0 \frac{\left[D_g(t)\right]^{\lambda_d}}{\left[A_g(t)\right]^{\lambda_a}},$$ Explain the Significance of Lambda's in numerator and denominator.
(v)	Should there be an operational level of war – as distinct from Strategic and Tactical levels of war or should the operational art be considered as way of linking strategic and tactical levels. Present your views and reasons.
(vi)	What has been your fundamental learning from the warfare simulations and strategies course?

PART-B

Answer any 4 of following questions Total Marks 44

2	On 31st December 2015, China announced raising of a Strategic Support Force (SSF). It is a critical change in their force structure for creating more robust power projection and expeditionary capabilities at par with China's expanding global footprint as claimed. Command of space, including the military use of outer space, is of increasing interest to the People's Liberation Army (PLA) as the Chinese Communist Party (CCP) armed forces are called. It seeks to develop new capabilities and operational concepts to support its growing range of military missions. The SSF is charged with overseeing Chinese military space, cyber, and electronic warfare capabilities for China's emerging aerospace expeditionary and power projection capabilities. PLASSF combines all aspect of Information warfare dimensions under one command. There is a need to assess this capability and its impact on the future warfare in term of delay induced, cohesive effort of the force and impact on the force potential of the forces in the battlefield.	11

Key: PsyOps: psychological operations; TT&C: telemetry, tracking, and control.

(Source: NDU, October 2, 2018)

PLASSF addresses the concern of Chinese Army that information dominance and denying adversaries the use of the electromagnetic spectrum is necessary to seize and maintain the strategic initiative in a conflict.

China's space-based C4ISR capabilities provide what is called by some PLA sources "space information support" or what the U.S. Air Force (USAF) calls "force enhancement." It involves space-based intelligence, surveillance, and reconnaissance (ISR), communication, and navigation capabilities to support operations in other domains. China has a wide-ranging counter space program that includes kinetic-energy, directed energy, co-orbital, electronic warfare, and cyber weapon programs that appear intended to threaten an adversary's space assets from the ground to geosynchronous orbit. China's counter space capabilities are used to conduct what the PLA calls "space attack and defense operations".

The SSF Network Systems Department is responsible for information warfare with a mission set that includes cyberwarfare, technical reconnaissance, EW, and psychological warfare. The integration of cyber and EW elements under one organization is a crucial step towards realizing the operational concept of integrated network and electronic warfare that the PLA has envisioned since the early 2000s.

PLASSF impacts on Information, Electronic, Space, Cyber, Media, and psychological warfare capabilities of PLA will be transformative; These need to be studied and evaluated for overall capability assessment of Chinese Military force, for threat assessment to any future adversary of China and finding and defining new or modified measures of effectiveness.

Capability Assessment: Identification and Understanding of capabilities of PLASSF (both Offensive and Defensive). What will be your approach for assessment of change in military capability/ change of the armed forces capability because of PLA strategic Support Force?

| 3 | "Non-strategic or tactical nuclear weapons refer to nuclear weapons designed to be used on a battlefield in military situations. This is opposed to strategic nuclear weapons, which are designed to be used against enemy cities, factories, and other larger-area targets to damage the enemy's ability to wage war" (US Department of Defence 2016, 17). | 11 |

A tactical nuclear weapon is that short range low yield nuclear weapon which is "launched" for an attack or defence in the aim of capturing or defending an area or incapacitating the adversary in a battle.

India's Cold Start Doctrine was designed as a retaliatory response by rapid mobilization of its conventional armour into integrated battle groups to attack multiple targets across the border. Pakistan considers that it will be highly outnumbered by the large strength of Indian forces and has taken that excuse to develop for tactical nuclear weapons to balance this number disadvantage. Pakistan developed its Tactical Nuclear Missile, "Nasr" (Hatf-9) short-range ballistic missile –a short-range, solid-fuel missile with the following specification.

Range : 60 km (Extended to 70 km)

Warhead : Enriched Plutonium

Yield : 0.5 –5 kt

Accuracy : 1 m

Guidance : Strap down Inertial guidance

Speed : Mach 5.6

Indian Nuclear Doctrine advocates a massive nuclear retaliation in case nukes are used against India. The TNWs usage however will be a limited usage and also in their territory.

How will you assess the 'Implications of Pakistan's Tactical nuclear weapon (TNW) on India' in future wars? What should be India's response if TNWs are used in war, even though Pakistan may use it in their territory but against Indian Armour inside their territory? How would you propose that Indian Nuclear doctrine be relooked and why?

| 4 | What are the key elements of technical and functional features of a futuristic wargame that you would like to develop? Your answer must include level, scope and resolution of the wargame in the assumptions. A detailed block diagram of the proposed wargame is also needed to be drawn. | 11 |

| 5 | India presently has a system of service–specific commands. However, combined and integrated commands, sometimes known as unified commands, have been established, and more are being suggested. The Andaman and Nicobar Command, established in 2001, is the sole fully operational theatre command, whereas the Strategic Forces Command, established in 2003, is an integrated functional command or designated combatant command. The Defence Cyber Agency, Defence Space Agency, and Special Operations Division are among the newly established integrated functional commands under the Integrated Defence Staff. The Air Defence Command is the first integrated command to be established. | 11 |

There is and has been significant support as well as significant opposition to some of the attempts at jointness and integration, such as the theaterisation process, at the highest levels of government and the public.

	There is a need to Evaluate Military Capability of Service-Specific Command System versus Joint and Integrated Command systems **Capability Assessment and Measures of Effectiveness:** Identification and comprehension of capabilities resulting from a change in command structure from a service-specific command structure to a unified (joint and/or integrated) command structure is critical. What will be your method to assessing changes in military capabilities/changes in the capability of the armed forces as a result of planned modifications to the Unified Command Structure? You can begin your proposed approach to assessing military capability with any of the following approaches: direct measurement/historical analysis, expert judgments and including their views through different methodologies, simulation of wars and or analytical models/mathematical models, or any combination thereof. What metrics or measurements of effectiveness would you employ/propose, and how will you evaluate each of those metrics of military capability?	
6	Draw a Petri Net Model of **any two** of the following combat scenarios (explain the places and transitions chosen along with the time/delay distributions you will chose for each transition in your model of the combat. Kindly write your assumptions (tactical and technical for the purpose of simulation). Also mark the places on your petri net model which will be used to collect tokens and measure the outcome of the simulation (a) Tank battle between an Armoured regiment of 45 Main battle tanks on Red Side and an Armoured Brigade of 135 Main battle tanks on the Blue side (b) Sortie generation and combat model of following air war scenario – 3 Squadrons (each squadron has 16 aircraft) of Su-30 MKI (with an availability figure of 65%) pitted against two squadrons of Mirage-2000 fighter aircraft (with an availability figure of 80%). (c) A naval task force of 1 Destroyer, 1 Frigate and one Aircraft Carrier is attacked by two submarine on high seas. Assume relevant capabilities of Anti-surface warfare within the task force which includes a complement of 4 anti-submarine helicopters	11
7	In assignment 2, during the course it was asked to enumerate the resemblances and differences of military capabilities of US, Russia, China, Pakistan and India with the help of 2021 IISS Military Balance.. Further, In assignment 3, static analysis approaches were required to be developed by the teams on C5ISR, Mosaic warfare and System Confrontation and System destruction warfare of future. In this context, list down your findings, learning and recommendations for India from your work in assignment 2 and assignment 3.	11