U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January 2024 Semester End Main Examinations

Programme: B.E. **Semester: VII**
Branch: Aerospace Engineering **Duration: 3 hrs.**
Course Code: 21AE7DCAMC **Max Marks: 100**
Course: Aviation Maintenance Concepts and Technologies

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Briefly explain the different phases of Aircraft Life Cycle (ALC).	CO 1	PO 1	**8**
	b)	What is the impact of research, design and development phase on aircraft life cycle cost?	CO 1	PO 1	**7**
	c)	Explain Airworthiness Limitation Item (ALI) while developing aircraft maintenance program.	CO 1	PO 2	**5**
		OR			
2	a)	What is the difference between Direct and Indirect Maintenance Cost?	CO 1	PO 1	**5**
	b)	Explain the reason for maintenance cost of modern aircraft in reducing compared to legacy aircraft	CO 1	PO 2	**5**
	c)	The Technical Services of an ABC Airline operating a fleet of Boeing 777 aircraft has captured the month wise data on defects occurred in the Undercarriage system of the fleet for the calendar 2021 for reliability analysis as given in Table 1. Calculate the Alert value for the defect rate for the undercarriage system for the fleet.	CO 1	PO 3	**10**
		UNIT - II			
3	a)	Explain the concept of packaging of maintenance tasks into checks and what are the advantages and disadvantages of letter (Block or Pyramid) and Phased (Equalized or Progressive) checks.	CO 1	PO 1	**7**
	b)	Explain the concept of modification and midlife upgrade in aircraft life cycle.	CO 1	PO 2	**5**

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		c)	An Aircraft charter company operating a general aviation aircraft intends to modify the aircraft by integrating the LIDAR system for mapping of lakes in urban areas. The LIDAR weighs 2 kg and to be located at a longitudinal distance of 1.5 m ahead of Firewall. As per the Flight manual, the datum point of the Aircraft is located at the firewall and the permissible range of longitudinal CG is 1.08 m to 1.20 m behind the datum point. The load and trim data for the unmodified aircraft for a typical operational flight is given below. Calculate the new CG and check if modification is acceptable from the limitations of CG locations.	CO 1	PO 3	**8**

Description of Equipment	Weight (kg)	Arm (Distance from Datum) (m)	Arm Location
Basic Empty Weight	560	1.02	Behind Datum
Front Seats with occupant	166	0.94	Behind Datum
Rear Seat	16	1.85	Behind Datum
Baggage area 1	34	2.41	Behind Datum
Baggage area 2	5	3.12	Behind Datum
Fuel -195 litres with specific Gravity 0.72	140	1.22	Behind Datum

			UNIT - III			
4	a)	A budget Airline operating a fleet of 20 Boeing 737 NG aircraft have logged the following categories of delays and flown 73,450 revenue flights for the period of one year during 2020. Calculate the Technical Dispatch reliability by segregating delays into controllable and uncontrollable delays.	CO 3	PO 3	**10**

Departure Delays for the Year 2020 for the Airlines			
Revenue Departures	73,450		
	Number of Delays		
Type of Delays	<15 Min	>15 Min	Total
Spares Not available	8	35	43
Bird Strikes	12	91	103
Shortage of AME	3	35	38
Ground Equipment Not available	2	11	13
Component Failure	13	344	357
Lightening strike	2	27	29
Incorrect Trouble Shooting	5	33	38
Unconfirmed / Nuisance Defects	4	135	139
Ongoing Servicing	2	34	36
Adverse weather	3	15	18
Air Traffic Congestion	14	10	24
Runway/ Apron debris	5	43	48

	b)	What do you understand by maintenance safety? What are the important ingredients of maintenance safety?	CO 1	PO 1	**5**
	c)	What are the major considerations for building Airworthiness during development of Airborne components and systems	CO 1	PO 2	**5**
		UNIT - IV			
5	a)	Explain the functioning of HUMS with Block Diagram.	CO 2	PO 1	**7**
	b)	Describe the three subsystems of Integrated Aircraft Health Monitoring.	CO 2	PO 1	**5**

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		c)	What are the different applications of NDT in aircraft structure and Jet engine inspection?	CO 2	PO 1	**8**
			OR			
	6	a)	What are the general guidelines for design for maintainability?	CO 2	PO 1	**5**
		b)	What are the main functions of aviation MRO Software?	CO 2	PO 1	**5**
		c)	The OEM of a narrow body commercial aircraft designed with Design for Maintainability features has developed the MPD with MSG-3 methodologies. As per the aircraft MPD, the planned/scheduled maintenance effort for Aircraft systems, Powerplant and Structures under their respective subcategories for the design life cycle period of 20 years is tabulated in the Table below. An airline operating the same aircraft fleet has captured the unscheduled maintenance effort for one aircraft for the design life cycle of 20 years are tabulated in the Table. The aircraft has logged 60,200 flying hours during the same period. Calculate the Planned Maintenance Percentage (PMP) and Maintenance Man Hours /Flying hours (MMH/FH) as the measures of maintainability of the aircraft.	CO 2	PO 3	**10**
			UNIT - V			
	7	a)	Which organisations are responsible for regulating the military aviation in India? Describe their role and nature of activities.	CO 3	PO 1	**7**
		b)	What do you understand by Harmonisation of Aviation Regulations?	CO 3	PO 1	**5**
		c)	What are the stages to be followed in creation of technical publications? And explain the function of technical illustration.	CO 3	PO 2	**8**

Scheduled and Unscheduled Maintenance Effort of narrow body Commercial Aircraft for Design Life Cycle of 20 Years

Maintenance Groups and Subgroups	Aircraft Systems	Power plant	Structures	Aircraft Systems	Power plant	Structures
Base Maintenance Cehcks	15200	8700	4200	12500	420	380
Zonal Checks	153	346	4325	82	43	456
Line Maintenance Checks	1543	927	105	192	154	25

Table. 1 (Q 2c)

Undercarriage System Failure Data for the Calendar Year 2021

Month	JAN	FEB	MAR	Flying Hours done for the sub period	APR	MAY	JUN	Flying Hours done for the sub period	JUL	AUG	SEP	Flying Hours done for the sub period	OCT	NOV	DEC	Flying Hours done for the sub period
Number of Defects for the Month	0	5	3	9500	0	4	3	8000	0	2	4	6900	5	0	3	9200

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