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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: VII**

Branch: Aerospace Engineering **Duration: 3 hrs.**

Course Code: 22AS7PCAMC **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)	Define aircraft maintenance and what are the objectives of aircraft maintenance?	CO1	PO1	**05**
	b)	List the aircraft maintenance philosophies in the order they have evolved and what are the differences between the Predictive and Proactive maintenance concepts?	CO1	PO12	**07**
	c)	What are the Principles of MSG (Maintenance Steering Group) methodology and compare MSG 2 and MSG 3.	CO1	PO2	**08**
		OR			
2	a)	Explain how the maintenance cost of modern aircraft is reducing despite the increase in complexity compared to legacy aircraft?	CO1	PO1	**05**
	b)	Briefly explain the different phases of aircraft life cycle.	CO1	PO5	**05**
	c)	The Technical Services of XYZ Airline operating a fleet of Airbus 340 aircraft has captured the month wise data on the defects that occurred in the hydraulic system of the fleet for the year 2021 for reliability analysis as depicted in Table 1. Calculate the Alert value for the defect rate for the Hydraulic system for the fleet.	CO2	PO12	**10**
		UNIT - II			
3	a)	Explain the concept of packaging of maintenance tasks into letter and phased checks.	CO1	PO1	**05**
	b)	What is unscheduled maintenance and what are the reasons for unscheduled maintenance in aviation?	CO2	PO5	**05**
	c)	An Aircraft charter company operating a general aviation aircraft intends to modify the aircraft by integrating the mines survey equipment weighing 5kg to be located at a longitudinal distance of 80 cm ahead of the firewall. As per the flight manual, the datum	CO3	PO12	**10**

point of the aircraft is located at the firewall and the permissible range of longitudinal CG movement 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.

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

OR

4	a)	What is MPD? and how do airline operators customize it into an Operator's Approved MPD (OAMPD)?	CO1	PO5	**06**
	b)	What are three criteria for maintenance task Intervals/schedules in the aircraft maintenance program and explain with an example operating cycle-based maintenance schedule.	CO3	PO6	**08**
	c)	Explain two methods of aircraft refueling in civil aviation and what are the advantages of the fuel hydrant system?	CO2	PO6	**06**
		UNIT - III			
5	a)	A full service XYZ Airline operating a fleet of 20 Airbus 320 aircraft has recorded the following types of delays and flown 70,500 revenue flights for a period of one year during the calendar year 2020. Calculate the Technical Dispatch reliability by segregating the delays into uncontrollable and controllable categories.	CO3	PO12	**10**
	b)	What are the tools used for ensuring airworthiness requirements?	CO1	PO6	**05**

Departure Delays for the Year 2020 for XYZ Airlines			
Revenue Departures	70,500		
	Number of Delays		
Type of Delays	<15 Min	>15 Min	Total
Spares Not available	2	44	46
Shortage of AME	4	33	37
Air Traffic Congestion	25	91	116
Ground Equipment	7	40	47
Component Failure	25	395	420
Foreign Object Damage	3	31	34
Incorrect Trouble Shooting	25	67	92
Unconfirmed / Nuisance Defects	14	153	167
Ongoing Servicing	9	31	40
Adverse weather	12	35	47

		c)	List the possible outcomes of unsafe maintenance in the order of their severity.	CO2	PO5	**05**
			OR			
	6	a)	What are the two ways the civil aircraft maintenance organization can be approved under DGCA regulations in India?	CO1	PO6	**06**
		b)	Explain the concept of MMEL, MEL and CDL with typical examples.	CO1	PO5	**07**
		c)	What are the differences between Continuing Airworthiness Management Exposition (CAME) and Management Organization Exposition (MOE)?	CO3	PO1	**07**
			UNIT - IV			
	7	a)	What is the role of aviation maintenance software tools and list the two broad categories of software tools used in aviation maintenance?	CO2	PO5	**08**
		b)	What are the expectations of aircraft operators on aircraft maintainability?	CO2	PO12	**05**
		c)	Explain how Airbus software tool AIRMAN REP@IR MANAGER has improved aircraft structural damage assessment.	CO2	PO5	**07**
			OR			
	8	a)	What are the most frequently used NDT methods in aviation?	CO2	PO6	**05**
		b)	Why is maintainability to be considered during design phases of an aircraft?	CO2	PO5	**05**
		c)	The OEM of a turbofan regional 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 given below. A regional airline operating the aircraft has captured the unscheduled maintenance effort for one aircraft for the design life cycle of 20 years which is tabulated in the Table. The aircraft has logged 40,500 flying hours during the same period. Calculate the Planned Maintenance Percentage and Maintenance Man Hours /Flying hours as the measures of maintainability of the aircraft.	CO2	PO12	**10**

			Scheduled and Unscheduled Maintenance Effort of Regional Turbofan Commercial Aircraft for Design Life Cycle of 20 Years			
			Flying hours logged 40,500 Hours / MPD Scheduled Maintenance Task Effort (Hours) / Unscheduled Maintenance Task Effort (Hours)			
			Maintenance Groups and Subgroups / Aircraft Systems / Power plant / Structures / Aircraft Systems / Power plant / Structures			
			Systems and Components Checks / 12261 / 7109 / 3909 / 1114 / 356 / 292			
			Zonal Checks / 140 / 216 / 3683 / 66 / 37 / 312			
			Line Maintenance Checks / 1407 / 834 / 91 / 180 / 120 / 16			
			UNIT - V			
	9	a)	What are the different categories of documents required in aircraft maintenance? Briefly explain the scope of manufacturers documents.	CO3	PO6	**08**
		b)	Name the aviation regulations which are important for aviation engineers. Explain the scope of CAR M.	CO3	PO6	**07**
		c)	What are the stages involved in creation of technical publications?	CO3	PO5	**05**
			OR			
	10	a)	Explain the function of technical illustration in creation of technical publications.	CO3	PO6	**07**
		b)	What do you understand by harmonisation of aviation regulations?	CO3	PO6	**08**
		c)	List the four standards/specifications applicable to aviation technical publication.	CO3	PO5	**05**

Table 1

Hydraulic 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	2	3	5	7300	7	2	5	6800	2	0	6	9200	2	5	6	8275

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