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

Autonomous Institute Affiliated to VTU

February / March 2023 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 **Date: 20.02.2023**

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

1 a) Explain the relation between Aircraft Maintenance, Reliability and Redesign? **7**

b) What are the differences between the Predictive and Proactive maintenance concepts? **5**

c) Explain with an example on how self-healing technologies can be used in aeroengines and structures to achieve the maintenance free aircraft concept. **8**

OR

2 a) Define Maintainability and what the parameters used for quantifying the maintainability in commercial aviation? **5**

b) What are the typical sources of data for Reliability Control Program in commercial Airlines? **5**

c) A budget Airline operating a fleet 10 Boeing 737 NG aircraft has flown a total of 34,305 flying hours during the year 2020. The defects data and the time taken to repair the Airconditioning system of the fleet for the year 2020 is tabulated below. Calculate the Maintainability, Reliability and Availability of the Avionics system for the fleet in terms of MTTR and MTBR. **10**

Avionics Sytem Failure and Repair Data for the Clender Year 2020												
Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Number of Defects for the Month	0	5	3	0	4	3	0	4	0	5	0	3
Time taken to Repair (Hours)	0	9	6		13	7		9		13		9

UNIT - II

3 a) Explain the two methos of Aircraft weighing? **5**

b) An Aero sport company operating a general aviation utility aircraft intends to modify the aircraft by integrating the cloud seeding system weighting 25 kg to be located at a longitudinal distance of 1.2 m behind 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. **10**

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

c) What are the three methods of towing an aircraft and what are the advantages of the modern Towing Tugs? **5**

UNIT - III

4 a) A full service MNY Airline operating a fleet of 20 Airbus 320 aircraft have experienced the following types of delays and flown 68700 revenue flights for period of one year during 2020. Calculate the Technical Dispatch reliability by segregating the delays into uncontrollable and controllable categories of delays **10**

Departure Delays for the Year 2020 for MNY Airlines			
Revenue Departures	68,700		
	Number of Delays		
Type of Delays	<15 Min	>15 Min	Total
Spares Not available	8	35	43
Shortage of AME	3	26	29
Ground Equipment Not available	2	11	13
Component Failure	13	344	357
Foreign Object Damage	2	27	29
Incorrect Trouble Shooting	0	33	33
Unconfirmed / Nuisance Defects	4	135	139
Ongoing Servicing	0	34	34
Air Traffic Congestion	12	91	103
Adverse weather	5	54	59

b) What are the 5 categories of Licensed Aircraft Maintenance Engineer under DGCA regulations? **5**

c) List the possible outcomes of unsafe maintenance in the order of their severity. **5**

UNIT - IV

5 a) What are the expectations of aircraft operators on aircraft maintainability? **7**

b) What are the Values/Benefits of AHM? **6**

c) What are the three primary ways the AHM reduces airline Schedule Interruptions? **7**

OR

6 a) Explain the use of NDT in different phases of life cycle of the product. **5**

b) What are the factors affecting the Product Maintainability? **5**

c) The OEM of a turboprop 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 give below. A regional airline operating the aircraft 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 50,200 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. **10**

Scheduled and Unscheduled Mainteence Effort of Regional Turboprop						
Flying hours logged 40,500 Hours	MPD Scheduled Mainteence Task Effort (Hours)			Unscheduled Mainteence Task Effort (Hours)		
Maintenance Groups and Subgroups	Aircraft Systems	Power plant	Structures	Aircraf Systems	Power plant	Structures
Systems and Components Checks	9500	6750	18500	5500	286	260
Zonal Checks	130	200	3480	55	30	292
Line Maintenance Checks	890	755	84	172	113	13

UNIT - V

7 a) List the Aviation Regulations which are important for aviation engineers. Explain the scope and importance of Part 21 OR Part M of the aviation regulations. **8**

b) Describe the Regulation Structure of DGCA, India for regulating civil aviation activities in India. **7**

c) Explain the concept of Minimum Equipment List? What are its salient features? **5**

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