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**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
(ONLINE)  
SEMESTER I  
SESSION 2020/2021**

COURSE NAME : AIRCRAFT SYSTEMS  
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DURATION : 2 HOURS  
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

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**SECTION A: Multiple choice questions**

**Q1** The pressure gauge of a hydraulic system provides information regarding the pressure of:  
a. the air in the accumulator  
b. the air and hydraulic fluid in the system  
c. the proportional pressure in the system  
d. the hydraulic fluid in the system  
(1 mark)

**Q2** The hydraulic fluid is changed, but the wrong fluid is replaced. This would lead to:  
a. high operating fluid temperature  
b. system failure from leaks and blocked filters, high temp and possible corrosion  
c. a rise in the reservoir fill level  
d. normal operation, it does not matter which fluid is used  
(1 mark)

**Q3** Accumulator floating piston:  
a. pushes the fluid up when being charged  
b. pushes the fluid down when being charged  
c. provides a seal between the gas and fluid  
d. prevents a hydraulic lock  
(1 mark)

**Q4** The primary purpose of a hydraulic reservoir is:  
a. to compensate for leaks, displacement and expansion  
b. to allow a space into which spare fluid may be stored  
c. to indicate system contents  
d. to maintain fluid between a jack and the accumulator  
(1 mark)

**Q5** Hydraulic pressure in a closed system:  
a. is greater in pipes of larger diameters  
b. is greater in pipes of smaller diameters  
c. does not vary with pipe diameter  
d. varies in direct proportion to the system demands  
(1 mark)

**Q6** The pressure filter in a hydraulic system:  
a. filters the fluid returning to the tank  
b. is fitted down stream of the pump  
c. can be by passed when maximum flow is required  
d. cleans the fluid as it leaves the reservoir  
(1 mark)

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- Q7** A high pressure hydraulic pump:
- needs a positive fluid supply
  - does not need a positive fluid supply
  - outlet pressure is governed by centrifugal force
  - does not need a cooling fluid flow
- (1 mark)
- Q8** Hydraulic pressure of 3000 Pa is applied to an actuator, the piston area of which is 0.02 m<sup>2</sup>, and the same pressure is exerted on actuator whose area is 0.04 m<sup>2</sup>. Which of the following statement is true?
- both have the same force
  - both jacks will move at the same speed
  - the smaller jack will exert a force of 600 N and the larger 1200 N
  - the smaller jack will exert a force of 60 N and the larger 120 N
- (1 mark)
- Q9** A main system hydraulic pump:
- does not need a positive fluid supply if primed before start up
  - always needs a positive fluid supply in order to prevent cavitation
  - does not need a positive fluid supply in order to prevent cavitation
  - can be run dry without causing any damage
- (1 mark)
- Q10** To prevent cavitation of the pump a hydraulic reservoir may be:
- pressurized
  - bootstrapped
  - above the pump
  - all of the above
- (1 mark)
- Q11** Landing gear ground locking pins are:
- fitted before flight to ensure the landing gear locks are fully cocked
  - removed prior to flight and returned to stores
  - fitted after flight to maintain a hydraulic lock in the downlock jack
  - removed prior to flight and stowed on the aircraft where they are visible to the crew
- (1 mark)
- Q12** In a typical high-pressure hydraulic brake system of a large transport aircraft:
- the aircraft main hydraulic system is connected to the brake by operation of a dual control valve
  - a non-return valve (NRV) is fitted to reduce the pressure of the aircraft hydraulic systems to that of the brake operation pressure
  - a separate parking brake system is usually
  - a pressure relief valve (PRV) is fitted to maintain pressure in the brake system if the aircraft hydraulic system fails
- (2 marks)

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- Q13** Nose-wheel shimmy may be described as:
- aircraft vibration caused by the nose-wheel upon extension of the gear
  - the amount of free movement of the nose-wheel steering takes effect
  - the oscillatory movement of the nose-wheel
  - a possibly damaging vibration of the nose-wheel when moving on the ground
- (1 mark)

- Q14** The "creep" may be described as the.
- decrease in inflation pressure due to increase in ambient temperature
  - gradual circumferential increase of tire wear
  - increase in inflation pressure due to decrease in ambient temperature
  - circumferential movement of the tire to the wheel flange
- (1 mark)

- Q15** Overcentre mechanisms in landing gear systems are used to:
- ensure that the nose-wheel does not exceed the maximum steering arc
  - ensure the nose-wheel is positioned fore and aft prior to retraction
  - increase in inflation pressure due to decrease in ambient temperature
  - circumferential movement of the tire to the wheel flange
- (1 mark)

- Q16** Compared to an attire fitted with an inner tube, a tubeless tire presents the following characteristics:
- 1) high heating
  - 2) valve fragility
  - 3) lower risk of bursting
  - 4) better adjustment to wheels

The combination containing all the correct statements is:

- 3, 4
- 2, 3
- 2, 4
- 1, 2, 3, 4

(2 marks)

- Q17** A tubeless tire has.
- 1) a built-in air tube
  - 2) no built-in air tube
  - 3) a crossed side casing
  - 4) a radial side casing

The combination containing all the correct statements is:

- 2, 3
- 1, 3
- 2, 4
- 1, 4

(2 marks)

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**Q18** A main landing gear is said to be “locked down” when:

- a. the strut is locked by an overcentre mechanism
- b. the actuating cylinder is at the end of its travel
- c. the corresponding indicator is amber
- d. it is in the down position

(1 mark)

**Q19** What is the component of the nose landing gear shown by number 2 in **Figure Q19 (Section A)**?

- a. Shock absorber
- b. Steering actuator
- c. Torsion link
- d. Retraction actuator

(2 marks)

**Q20** The number in **Figure Q20 (Section A)** that shows the downlock strut is:

- a. Number 3
- b. Number 6
- c. Number 9
- d. Number 10

(2 marks)

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*[Faint handwritten notes and markings at the bottom right of the page]*

## SECTION B: Subjective questions.

- Q1 (a) “Good lubricity and good heat dissipation are two important properties of hydraulic fluids”. Elaborate the statement. (9 marks)
- (b) In an aircraft lubrication system, oil at 20°C flows from the sump through the engine where the temperature of the oil increases rapidly to 80°C. If the specific heat capacity of the engine oil at constant pressure is 2,100 J/(kg °C) and its mass is 0.3 kg, calculate the heat energy absorbed. (8 marks)
- (c) A 0.5 kg heat exchanger fin which made up of aluminium alloy decreases in its temperature from 180°C to 100°C. By taking the specific heat capacity of aluminium alloy at constant pressure to be 0.92 kJ/(kg°C), calculate the heat released by the fin. (8 marks)
- Q2 (a) Give the most important characteristics of lubricant oil. Discuss your answer. (5 marks)
- (b) In a Cessna 182S air-conditioning system, 15 m<sup>3</sup>/s of air at a temperature of 27°C pass over an evaporator which reduces its temperature to 13°C. The air is then blown over a reheater, which increases its temperature to 18°C. Obtain:
- (i) The amount of air handled by the blower; (5 marks)
- (ii) The quantity of the supplied air. (5 marks)
- (c) An Airbus A380 is descending from an altitude 30,000 ft to 3,000 ft at rate 1,000 fpm. At altitude 30,000 ft, the cabin is pressurised at level 6,000 ft. The pilot wants the cabin pressure to be at 1,000 ft when aircraft reaches 3,000 ft. Calculate the ideal rate of descending for the cabin pressure. (10 marks)

-END OF QUESTIONS -

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