

教务处试卷编号:

备注: 试卷背面为演草区(不准用自带草稿)

课程编号:

考核方式: (闭卷、开卷)

考核时间: (2学时) 主考教师允许携带的物品: 计算器

大连海事大学 2015—2016 学年第 2 学期 《MARINE DIESEL ENGINE》 试卷 (B)

题号	一	二	三	四	五	六	七	八	九	十	卷面分(占总分比例 70%)
得分											

I. Please choose one best answer and write the answer in the corresponding column(1 point each, total 20 points)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
D	C	B	C	B	A	B	C	D	C	B	A	D	C	B	B	A	D	B	A

- The governor of a generator engine is to _____.
A. make the engine stop
B. regulate the timing of camshafts
C. make the rpm stabilize at any required value
D. make the engine run at nearly constant speed
- The rotating range of the low speed diesel engine is usually lower than _____.
A. 100 rpm B. 200 rpm C. 300 rpm D. 500 rpm
- The centrifuge is a perfectly balanced piece of equipment, rotating _____, so all parts should be handled with care.
A. at low speed B. at high speed
C. at medium speed D. None of the above.
- The centrifugal separation of two liquids results in _____.
A. the formation of a circular interface between the two
B. the formation of a cylindrical interface among the two
C. the formation of a cylindrical interface between the two
D. the formation of a circular interface among the two
- When a clarifier is running the impurities and water collect at the bowl _____.
A. center B. periphery C. inlet D. upper parts
- An electrically driven automatically operating auxiliary blower is provided for slow speed and _____ of a low speed diesel engine.
A. manoeuvring operations B. bad combustion C. cooling D. mooring trial
- In a diesel engine, fuel must be broken up into a spray of fine droplets to _____.
A. increase its quality B. obtain complete burning C. reduce its weight D. All of the above.
- The space between cylinder liner and jacket is called _____.
A. the circulating tank B. the scavenge box
C. the cooling water space D. the cooler
- The oil lubricating diesel engine cylinders usually contain additives formulated to impart a high degree of alkalinity to _____ the acid conditions.
A. invade B. provide C. detergent D. neutralize
- When the follower is on the base circle of the cam with a normal shape, the pump plunger is at the _____ of its stroke.
A. top B. nip C. bottom D. middle
- IMO's current maximum allowable NOx emission levels are depend on the _____ of the engine.
A. load B. speed C. application D. power
- Medium speed engines have a _____ power to weight ratio than the slow speed two stroke engine, but due to the higher speeds tend to have _____ maintenance intervals.
A. higher/reduced B. higher/increased C. lower/reduced D. lower/increased
- Valve overlap is the period during which _____.
A. the inlet valve is open B. the exhaust valve is open
C. both valves are closed D. both valves are open
- The distance between TDC and BDC of the diesel engine is called a _____.
A. clearance B. radius C. stroke D. cycle
- Connecting rods in a trunk-piston diesel engine are used to connect the _____.
A. piston to crosshead B. piston to the crankshaft
C. rocker arm to the camshaft D. crosshead to the crankshaft
- For a purifier changing to a gravity disc with smaller hole diameter will move the interface towards the _____.
A. bowl periphery B. bowl center C. upper surface D. lower surface
- The starting air bottle should be pumped up to maximum pressure by the _____ before start of the engine.
A. air compressor B. refrigeration compressor C. vacuum pump D. purifier
- If black smoke is coming from the exhaust stack of a diesel engine, which of the following would be the trouble?
A. bad exhaust valve B. leaky fuel injectors
C. not enough air D. All of the above.
- The most common cause of lowering the crankcase lube oil flash point is _____.
A. more water contents B. contamination with fuel oil
C. higher temperature D. sufficient cooling of oil mist
- The _____ of the gravity disc is too big. It cause oil to flow through the water outlet. We changed the disc and no oil is found in the water outlet.
A. diameter B. gravity C. circumference D. cylinder

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2. Explain following definitions (2 points each, total 20 points).

- 1) Two stroke engine:
The 2-stroke diesel engine accomplishes its cycle through two piston strokes, that is compression and expansion, the gas exchanging takes place around the bottom dead centre.
- 2) Turbocharging: Increasing the density of the charge air is accomplished by exhaust gas turbocharging, in which a turbine wheel driven by exhaust gases from the engine is rigidly coupled to a centrifugal type air compressor.
- 3) Scavenging: Scavenging is the removal of exhaust gases by blowing in fresh air.
- 4) flash point: The lowest fuel temperature at which the small flame ignites a flash of flame across the surface of the fuel, indicating the presence of flammable mixture above fuel.
- 5) Top dead centre(TDC): The piston is at the highest position
- 6) pour point: This is the lowest temperature at which an oil remains fluid and thus is important to know for onboard handling purposes.
- 7) Constant Speed Governor: The governor maintains the engine speed at a single set value, from 'no-load' to 'full-load' conditions.
- 8) Compression ratio: This is the ratio of total cylinder volume to compression volume. the theoretical compression ratio is :
$$\epsilon = \frac{V_1}{V_2} = \frac{V_1 + V_c}{V_c}$$
- 9) Penetration: Penetration refers to the distance the oil droplets travel into the combustion chamber before mixing with the air and igniting.
- 10) Clarifier: A Centrifuger mainly to separate impurities from oil

3. answer the following questions (total 38 points) :

(1) State the advantages and disadvantages of 'pulse' system of turbo-charging arrangement (6 points)

For Pulse system, The advantages is as follows:

- More exhaust power can be used
- high sensitivity;
- Good low load and low speed performance,
- Better scavenging

The disadvantages is as follows:

- Poor turbine efficiency and turbine operation rough
- Exhaust piping complex

(2) What is Turbulence ?. Explain the Turbulence and its effect on the combustion process. (8 points)

Turbulence is the movement of compressed air and fuel within the combustion space before combustion occurs.

Turbulence will improve the mixing of fuel and air for effective and rapid combustion.

It is particularly desirable for rapid combustion of heavy fuels in medium or higher speed engine.

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(3) The causes of Scavenge Fire are the combustible deposits accumulation, what are they(6 points)

Oil sludge accumulation in the scavenge space is generally from three way, first too much cylinder oil(2 points),
second un-burnt fuel blow-by(2 points),
and third the crankcase oil leakage from piston rod gland(2 points).

(4) State the requirements for the start air system(6points)

The total capacity of air receivers is to be sufficient to provide, without replenishment,

- not less than 12 consecutive starts alternating between ahead and astern of each main engine of the reversible type,
- and not less than 6 consecutive starts of each main non-reversible type engine connected to a controllable pitch propeller or other device.
- The number of starts refers to the engine in cold and ready-to-start condition
- The number of air receivers for main engine is not less than 2.

The starting air valves remain open for a certain number of crank degrees.
to start the engine in any crankshaft position

- two-stroke engines, 360 / 110 at least four cylinders
- four-stroke engines, 720/140 at least six cylinders

(5) 1. Please describe the main differences of piston between two-stroke crosshead engine and four-stroke trunk piston engine. (6 points)

The piston of crosshead engine consists of piston crown, piston skirt, piston ring(sealing ring only) and piston rod (3 points)
the piston connect to the crosshead by piston rod. (1 points)

The trunk piston has no piston rod, it has a piston pin which connects the connecting rod directly (1 points)
and the trunk piston engine has two kinds of piston rings: the sealing ring and oil ring. (1 points)

(6) how to dry clean the turbine side of turbocharger(6 points)

turbine dry cleaning, the requirements are

- Turbine washing at full load (2 points)
- cleaning duration is about 30 sec(2 points)
- The cleaning medium is granulate(1 points)
- Recommended washing intervals is about 40 operating hours(.2 days)(1 points)

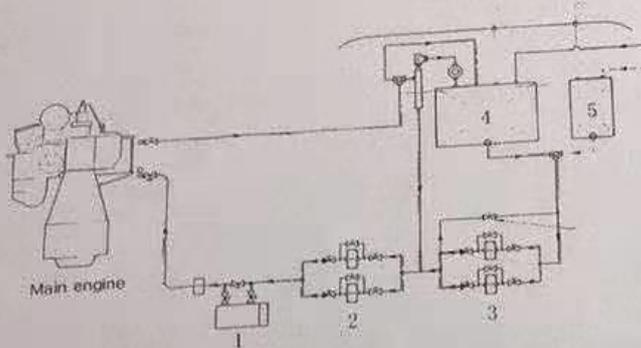
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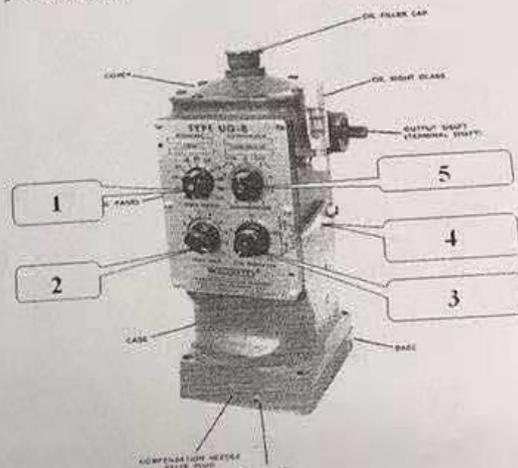
4. according to the sketch, give the name of the parts in number(5 points):
 (1) Fuel oil system (5 points):



- 1----prehea
- 2----fuel circulating pump
- 3----fuel supply pump
- 4---- Heavy Fuel Oil service TK
- 5---- MDO Tank

(2)UG-8 governor
 1---- Speed Droop

- 2---- Load Limit control
- 3---- SYN. INDICATOR
- 4---- compensation point
- 5---- Synchronizer



5. According to the following parameters, calculate the following:

cylinder bore	400 mm
stroke	1770 mm
run speed	146 r/min
fuel consumption	1164.51 kg/h
mean effective pressure	21 bar
number of cylinder	6
heat value of fuel	42.700MJ/kg

calculation:

- a. Stroke/bore ratio (1 point)
- b. mean piston speed (2 point)
- c. cylinder constant (2 point)
- d. engine output (2 point)
- e. specific fuel oil consumption(SFOC) (2 point)
- f. Fuel consumption per day (1 point)
- g. Thermal efficiency (2 point)

Calculation:

a. Stroke/bore ratio = $1770/400 = 4.425$

b. mean piston speed = $sn/30 = 1.77 \times 146 / 30 = 8.614 \text{ m/s}$

c. cylinder constant = $V_{sm}/60,000 = \frac{1}{60000} \times \frac{3.14}{4} D^2 S m = 3.705 \times 10^{-6}$

d. engine output = $C p_e n i = 3.705 \times 10^{-6} \times 21.0 \times 10^5 \times 146 \times 6 = 6815.72 \text{ kW}$

e. SFOC = fuel consumption / engine output = $1164.51/6815.72 = 0.171 \text{ kg/kWh} = 171 \text{ g/kWh}$

f. Fuel consumption per day = fuel consumption $\times 24 = 1164.51 \times 24 = 27948 \text{ kg} = 27.948 \text{ T}$

g. Thermal efficiency = $3600 \times P/B \times 1/CV = 3600 \times 6815.72 / 42700 \times 1164.51 = 49.3 \%$