（首页）

专业班级：　　　　学号：　　　　姓名：

教务处试卷编号：
备注：试卷背面为演草区（不准用自带草纸）　　装　　　　订　　　　线
　　　考核方式：（闭卷、开卷）　考核时间：（2 学时）　主考教师允许携带的用品：计算器
课程编号：

大连海事大学 2015--2016 学年第 2 学期《 MARINE DIESEL ENGINE 》试卷（A）　答案

题号	一	二	三	四	五	六	七	八	九	十	卷面分（占总分比例 60 %）
得分											

1. 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
B	A	D	C	B	B	A	D	B	A	D	C	B	C	B	A	B	C	D	C

1. IMO's current maximum allowable NOx emission levels are depend on the _____ of the engine.
   A. load　　　B. speed　　　C. application　　　D. power

2. 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

3. 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

4. The distance between TDC and BDC of the diesel engine is called a _____.
   A. clearance　　B. radius　　C. stroke　　D. cycle

5. 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

6. 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

7. 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

8. 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.

9. 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

10. 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

11. 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

12. 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

13. 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.

14. 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

15. When a clarifier is running the impurities and water collect at the bowl ___.
    A. center　　B. periphery　　C. inlet　　D. upper parts

16. 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

17. 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.

18. 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

19. 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

20. 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

2.Explain following definitions (2 points each, total 10 points)

1) Diesel engine: Diesel engine is a reciprocating, compressing ignition, internal combustion engine.

2) Scavenging: Scavenging is the removal of exhaust gases by blowing in fresh air.

3) Supercharging: It's a process of pushing a higher pressure air charge into the cylinder. Pressure at the beginning of compression in the cylinder will be higher than the atmospheric pressure.

4) Viscosity: The viscosity of oil is the measure of its resistance to flow.

5) Governor: It is a device which automatically controls or limits the speed of an engine by adjusting the amount of fuel put into the engine.

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) Atomization:Atomization is the splitting up of fuel into very small droplets by the fuel injector forcing fuel at high pressure through small atomizing holes.

8) Compression ratio: This is the ratio of total cylinder volume to compression volume.   the theoretical compression ratio is : $\varepsilon = \dfrac{V_a}{V_c} = \dfrac{V_u + V_c}{V_c}$

9) Surging: If the air pressure generated in the blower falls below delivery pressure, there will be a sudden breakdown of air delivery. This will be followed immediately by a backward wave of air through the blower which will continue until the delivery resistance has decreased sufficiently for air discharge to be resumed.

10) Purifier: A Centrifuger mainly to separate water from oil

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

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

For constant pressure system, The advantages is as follows:
    It has a high turbine efficiency;
    Good performance at high load, efficient and smooth turbine operation
    Exhaust piping simple
    Easy management
The disadvantages is as follows:
    Poor performance at part load, Less sensitivity
    Scavenge assistance essential

(2) **Atomisation** is associated with combustion in a compression ignition engine, explain its definitions and its effect on the combustion process. (8 points)

Atomization is the splitting up of fuel into very small droplets by the fuel injector forcing fuel at high pressure through small atomizing holes. (3 points)
Atomized droplets have a high surface to mass ratio giving good heat transfer from the hot compressed air in the cylinder causing rapid evaporation and mixing(3 points).
In this way, the combustion process will be finished rapidly and completely. (2 points)

(3) *Hot spot is the key factor of crankcase explosion, please point out which engine parts may be the sources of hot spot.(6 points)*

Any metal to metal contact will produce a 'Hot Spot' due to friction, this can be at a bearing, guides, piston rod glad, chain or gear drive, integral thrust block, or any location where steel can rub against steel in the crankcase region because of defective lubrication.
SOURCES OF HOTSPOT may be occurred due to bad working of the bearings in crankcase, these bearings including :
　main bearings;
　bottom end bearings;
　cross-head bearings, slides;
　gudgeon pin bearings;
　transmission gear or chain bearing.
Hot gases blow-past and hot piston may also the sources of hot spot.

(4) *There are many components in the heavy diesel engine starting air system , write the name of the components and their main function. (6 points)*
Air receiver: reserving high pressure compressed air
Starting control valve: control the engine starting\
Main starting valve: general switch of starting air system. Working under the control of starting control valve,
Air distributor: control the order of compressed air going into cylinder
Cylinder starting valve. Under the control of air distributor, control the compressed air going into each cylinder.
Air compressor: produce compressed air.

(5) Please describe the main differences of crankshaft between crosshead engine and trunk piston engine. (6 points)
For lubricating the connecting rod large end bearing(crankpin bearing), the trunk piston engine crankshafts must drill oil holes between main journal and crankpin to let the lub oil going through, (2 points)
the lubricating oil of crosshead engine crankpin bearing is supply from the crosshead, so there is no any hole in the crankshaft of crosshead engine. (2 points)

The crosshead engine has a large stroke/bore ratio, so the radius of crosshead engine is larger. (2 points)

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

Turbine washing at 10% load(2 points)

Water pressure: approximately 3 bar(1 points)

Washing duration 10-20 min(1 points)

Recommended washing intervals 250 operating hours(1 points)

Cleaning medium: fresh water (no seawater, no chemical additives) (1 points)

4. According to the sketch, give the name of the parts in number (10 points)
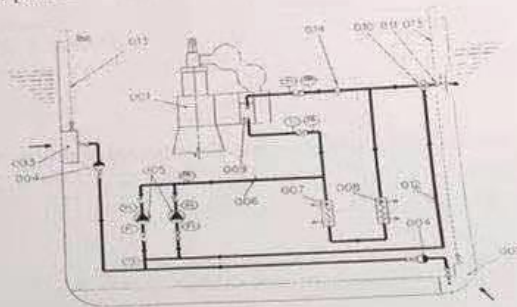
(1) sea water cooling system (5 points):

003------high sea chest(sea gate, sea valve)

004------SW filter:(sea water filter)

005------Sea Water pump

008------cooler (lub. Oil cooler, fresh water cooler, cylinder water

009------Scavenge air cooler (inter-cooler)

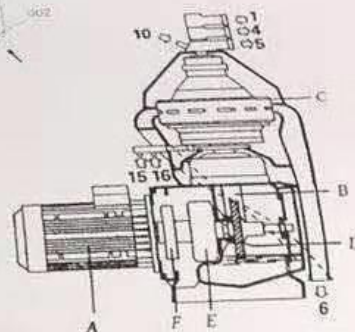(2) according to the sketch, give the name of the parts in number and letter (5 points):

1------ oil inlet

4------ clean oil outlet

5------ water outlet

A------- motor

C----- separator bowl

5. calculation(12 points)

Wartsila RT-flex82C two stroke engine's parameters are as following :

cylinder bore	820mm
stroke	2646 mm
run speed	102 r/min
fuel consumption	7684kg/h
mean effective pressure	19.0bar
number of cylinder	10
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 = 2646/820 = 3.23

b. mean piston speed = sn/30 = 2.646×102 / 30 = 9.0 m/s

c. cylinder constant = Vsm/60,000 = $\dfrac{1}{60000}\dfrac{3.14}{4}D^2 Sm$ = 2.33×10^{-5}

d. engine output = C p$_e$ n i = 2.33×10^{-5}×19.0×10^5×102×10 = 45155.4kW

e. SFOC = fuel consumption / engine output = 7684/45155.4 = 0.170kg/kWh = 170 g/kWh

f. Fuel consumption per day = fuel consumption×24 = 7684×24 = 184416kg = 184.42T

g. Thermal efficiency = 3600×P/B×LCV = 3600×45155.4/42700×7684 = 49.54 %