AKENTEN APPIAH-MENKA UNIVERSITY OF SKILLS TRAINING AND ENTREPRENEURIAL DEVELOPMENT

DEPARTMENT OF MECHANICAL AND AUTOMOTIVE TECHNOLOGY

END OF SEMESTER EXAMINATIONS (2020/2021) SECOND SEMESTER

COURSE CODE	AUT 121
COURSE TITLE	INTERNAL COMBUSTION ENGINES
DURATION	TWO (2) HOURS
LECTURER	DR. S. K. AMEDORME
INSTRUCTION(S)	THE PAPER CONSISTS OF SECTION A AND B. ANSWER SECTION A ON THE QUESTIONS PAPER AND ANY TWO (2) QUESTIONS FROM SECTION B IN THE ANSWER BOOKLET. SANDWICH STUDENTS

INDEX NUMBER.....

PROGRAMME.....

SECTION A

1. What is the correct sequence in the Otto Four-Stroke Cycle engine?

A. Compression → Exhaust → Induction → Power

B. Compression → Power → Induction → Exhaust

C. Induction → Compression → Power → Exhaust

D. Induction → Power → Exhaust → Compression

2. The air-fuel ratio of the petrol engine is controlled by

A. fuel pump

B. governor

C. injector

D carburetor

3. The air standard efficiency of Otto cycle is given by

A. $\eta = 1 - \frac{1}{r^{\gamma+1}}$

B. $\eta = 1 + \frac{1}{r^{\gamma+1}}$

C. $\eta = 1 - \frac{1}{r^{\gamma-1}}$

D. $\eta = 2 - \frac{1}{r^{\gamma+1}}$

4. Which of the following is not an internal combustion engine

A. 2-stroke petrol engine

B. diesel engine

C. gas turbine

D. steam turbine.

5. The air standard efficiency of Diesel cycle is given by

A. $\eta = 1 - r^{1-\gamma}\left\{\frac{r_c^{\gamma}-1}{\gamma(r_c+1)}\right\}$

B. $\eta = 1 - r^{1-\gamma}\left\{\frac{r_c^{\gamma}+1}{\gamma(r_c-1)}\right\}$

C. $\eta = 1 - r^{1-\gamma}\left\{\frac{r_c^{\gamma}-1}{\gamma(r_c-1)}\right\}$

D. $\eta = 1 + r^{1-\gamma}\left\{\frac{r_c^{\gamma}+1}{\gamma(r_c-1)}\right\}$

6. As a result of detonation in an I.C. engine, the following parameter attains very high value

A. peak pressure

B. rate of rise of pressure

C. rate of rise of temperature

D. peak temperature

7. The process of breaking up of a liquid into fine droplets by spraying is called

A. vaporisation

B. carburetion

C. injection

D. atomization

8. Compression ratio of IC engines is

A. the ratio of volumes of air in cylinder before compression stroke and after compression stroke

B. volume displaced by piston per stroke and clearance volume in cylinder
C. swept volume/cylinder volume
D. cylinder volume/swept volume.
9. Supercharging is the process of
A. supplying the intake of an engine with air at a density greater than the density of the surrounding atmosphere
B. providing forced cooling air
C. injecting excess fuel for raising more load
D. supplying compressed air to remove combustion products fully
10. In a diesel engine, the fuel is ignited by
A. spark
B. injected fuel
C. heat resulting from compressing air that is supplied for combustion
D. ignitor
11. The air standard efficiency of an Otto cycle compared to diesel cycle for the given compression ratio is
A. same
B. less
C. more
D. more or less depending on power rating
12. If the compression ratio of an engine working on Otto cycle is increased from 5 to 7, the percentage increase in efficiency will be
A. 2%
B. 4%
C. 8%
D. 14%
13. Pick up the wrong statement
A. petrol engines occupy more space than diesel engines for same power output
B. 2-stroke engine can run in any direction
C. In 4-stroke engine, a power stroke is obtained in 4-strokes
D. thermal efficiency of 4-strokc engine is more due to positive scavenging
14. An engine indicator is used to determine the following
A. speed
B. temperature
C. volume of cylinder
D. Mean effective pressure (m.e.p) and Indicated Horse Power (I.H.P)
15. Combustion in compression ignition engines is
A .homogeneous
B. heterogeneous
C. both (a) and (b)
D. turbulent.
16. Engine pistons are usually made of aluminum alloy because it
A. is lighter
B. wears less
C. absorbs shocks
D.is stronger

17. The air standard Otto cycle comprises
A. two constant pressure processes and two constant volume process
B. two constant pressure and two constant entropy processes
C. two constant volume processes and two constant entropy processes
D. none of the above
18. Compression ignition engines operate on
A. Otto cycle
B. Diesel cycle
C. Dual cycle
D. Carnot cycle
19. Spark ignition engines operate on
A. Otto cycle
B. Diesel cycle
C. Dual cycle
D Carnot cycle
20. Which of the following is the lightest and most volatile liquid fuel
A. diesel
B. kerosene
C. fuel oil
D. gasoline
21 .A stoichiometric air-fuel ratio is
A .chemically correct mixture
B. lean mixture
C. rich mixture for idling
D. rich mixture for over loads
22 The knock in diesel engine occurs due to
A. instantaneous and rapid burning of the first part of the charge
B. instantaneous auto ignition of last part of charge
C. delayed burning of the first part of the charge
D. reduction of delay period
23 Otto cycle is also known as
A. constant volume cycle
B. constant pressure cycle
C. constant temperature cycle
D. none of the mentioned
24. A diesel engine has compression ratio from
A. 6 to 10
B. 10 to 15
C. 16 to 22
D. 25 to 40
25. In Diesel cycle, heat addition takes place at
A. constant temperature
B. constant pressure
C constant volume
D. none of the above
26. The combustion in spark ignition engine is

A. homogeneous
B. heterogeneous
C. laminar
D. none of the above
27. The flywheel of an internal combustion engine maintains the smooth rotary motion of the
A. camshaft.
B. crankshaft.
C. gearbox.
D rear wheels.
28. The ignition quality of petrol is expressed by
A. Cetane number
B. Octane number
C. Calorific value
D All of these
29. The thermal efficiency of a standard Otto cycle for a compression ratio of 5.5 will be
A. 50%
B. 25%
C. 100%
D. 75%
30. In a diesel engine, the duration between the time of injection and ignition, is known as
A. pre-ignition period
B. burning period
C. period of ignition
D. delay period
31. In a four stroke cycle, the minimum temperature inside the engine cylinder occurs at the
A. beginning of exhaust stroke
B. beginning of suction stroke
C. end of suction stroke
D. end of exhaust stroke
32 Pre-ignition is caused by the spontaneous combustion of the mixture before the end of the compression stroke, and is due to
A. overheated spark plug points
B. cylinder walls being too hot
C. red hot carbon deposits on cylinder walls
D. any one of these
33. Which of the following does not relate to a compression ignition engine?
A. Governor
B. Fuel pump
C. Fuel injector
D. Carburettor
34. Theoretically, a four stroke cycle engine should develop _____ power as that of a two stroke cycle engine.
A. same
B. double
C. half
D. four times

35. The correct mixture strength (by weight) for petrol is about
A. 14.6:1
B.22.6:1
C.18.5:1
D. 20.4:1
36. Which of the following statement is correct regarding petrol engines?
A. The fuel supplied to the engine cylinder is mixed with necessary amount of air and the mixture in ignited with the help of a spark plug.
B. fine fuel spray mixed with air is ignited by the heat of compression which is at a high pressure.
C. The fuel is first evaporated after passing through a carburettor and is mixed with air before ignition.
D. all of the above
37. The advancing of spark timing in spark ignition engines will _____ knocking tendency.
A. reduce
B. increase
C. none of these
D not affect
38. The working pressure and temperature inside the cylinder of an internal combustion engine is _____ as compared to a steam engine.
A. low
B. very low
C. very high
D high
39. In compression ignition engines, swirl denotes a
A. rotary motion of the gases in the chamber
B. radial motion of the gases in the chamber
C. none of the above
D. haphazard motion of the gases in the chamber
40. In a four stroke cycle petrol engine, the pressure inside the engine cylinder during the suction stroke is _____ the atmospheric pressure.
A. equal to
B. middle
C. above
D. below

SECTION B [60 Marks]

Answer any two (2) questions from this section

1a. With the help of a diagram describe the working principle of the four stroke S1 and CI engines. 20 marks

b. State five differences between 4-stroke S1 and C1 engines 10 marks

2. Draw the schematic, T-s and P-v diagrams of the ideal Otto cycle. State the four processes that make up the Ideal Otto cycle. 15 marks

b. The ideal Otto cycle with a specified compression ratio is executed using (a) air (n=1.4 (b) argon n= 1.6 (c) ethane n=1.2 as the working fluid. For which case will the thermal efficiency be the highest? 10 marks

c. Sketch the p-v diagram of the actual four stroke spark ignition engine 5 marks

3a. Describe a two stroke S1 engine with a line diagram. What modifications are required to the two stroke C1 engine? 10 marks

b. State five differences between four stroke and two stroke engines 5 marks

c. State five differences between single and multi-cylinder engines 5 marks

d. Determine the air-fuel (A/F) ratio on mass basis for the complete combustion of gasoline treated as octane, C_8H_{18} with the theoretical amount of air. Take molecular mass of O_2 =32, N_2 = 28, C =12, H=1

10 marks