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The Open University of Sri Lanka
Faculty of Engineering Technology

Study Programme	:	Bachelor of Technology Honours in Engineering
Name of the Examination	:	Final Examination
Course Code and Title	:	**MEX4230 Production Technology**
Academic Year	:	2016/17
Date	:	November 09, 2017
Time	:	0930 hrs. – 1230 hrs.
Duration	:	3 hours

General instructions

1) Read all instructions carefully before answering the questions
2) This question paper consists of 08 questions, All questions carry equal marks.
3) Answers any 05 questions only.

Question 01.

a) Define the term metrology and explain main areas of metrology.

b) State five (05) requirements to be considered when selecting a measuring instrument.

c) Explain the use of Sine Bar quoting an appropriate practical application.

Question 02.

a) State the principle of interferometry.

b) Within the scope of surface texture, how is roughness distinguished from waviness?

c) Calculate the Center Line Average (CLA) and Root Mean Square (RMS) values of roughness for a graph, having 100 horizontal magnification and 10000 vertical magnification for a sampling length of 1.2 mm. The areas above the datum line are 100 mm^2, 120 mm^2, 140 mm^2, 40 mm^2 and below the datum line are 80 mm^2, 40 mm^2, 150 mm^2, 90 mm^2.

Question 03.

a) Name four (04) various types of pitch errors found in screw threads.

b) Briefly explain three (03) methods which can be used to measure the profile of a gear tooth.

c) Explain what is meant by "interchangeability" in context of metrology and discuss its importance.

Question 04.

a) Illustrate the types of fits. State clearly under what circumstances each type of fit is used. (You may use appropriate practical examples)

b) Calculate the fundamental deviation and tolerances and hence obtain the limits of size for hole and shaft pair in the fit: 25 H_8d_9. The diameter steps are 18 mm and 30 mm. The fundamental deviation for *'d'* shaft is given as $-16D^{0.44}$. The tolerance unit is,

$$i = 0.45\sqrt[3]{D} + 0.001\,D$$

The tolerance grades for number 8 quality is $25i$ and for number 9 quality is $40i$.

Question 05.

a) Distinguish between orthogonal and oblique cutting.

b) In an orthogonal cutting operation, the tool has a rake angle = 15°. The chip thickness before the cut = 0.30 mm and the cut yields a deformed chip thickness = 0.65 mm. Calculate,

(i) the shear plane angle and
(ii) the shear strain for the operation.

Question 06.

a) Briefly explain four (04) mechanisms of tool wear encountered in metal cutting operations.

b) Illustrate the variation of cutting speed (V) against the cutting time (T) and derive Taylor's tool life relationship in usual notations.

c) Briefly explain three (03) gear-cutting processes.

Question 07.

a) Explain the various geometrical tests that are to be performed to get a better accuracy in the machine tool.

b) Assuming that the spindle speeds are in geometrical progression, design a four (04) speed gear box to obtain speed variation between 112*rpm* and 624*rpm*. The gearbox is driven by a motor with speed of 400*rpm*. The standard values of common ratios (φ) are 1.12, 1.26, 1.41 and 1.58.

(i) Calculate spindle speeds of gear box.
(ii) Propose a suitable structural formula and draw a kinematic diagram.

Question 08.

a) What is strain hardening? Explain the importance of strain hardening in manufacturing.

b) Explain the behavior of flow stress (σ_f), during cold and hot working processes.

c) Distinguish between "elastic deformation" and "plastic deformation".

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THE OPENUNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
DIPLOMA IN TECHNOLOGY – LEVEL 4
FINAL EXAMINATION

MEX 4232 -AUTOMOBILE TECHNOLOGY

DATE : 5th December 2017
TIME : 13:30Hrs to 16:30 Hrs
DURATION : THREE HOURS

READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE ANSWERING THE QUESTION PAPER

Instructions.: This question paper consists of seven (07) questions. You are required to answer any six (06) questions. All questions carry equal marks.

Question 01

New materials such as advanced ceramics (in valves), light metals and plastics are being popularly used in modern automobiles making a change in the automobile industry. Briefly explain the main objectives of this change with particular reference to the following: Higher performance, Lower fuel consumption, Lighter weight and Reduced exhaust emissions.

Question 02

(a) Four main stages of a two stroke gasoline engine during its operation are illustrated in Figure Q2. Briefly explain the operating principle of the engine by arranging the stages shown in the figure in correct sequence.

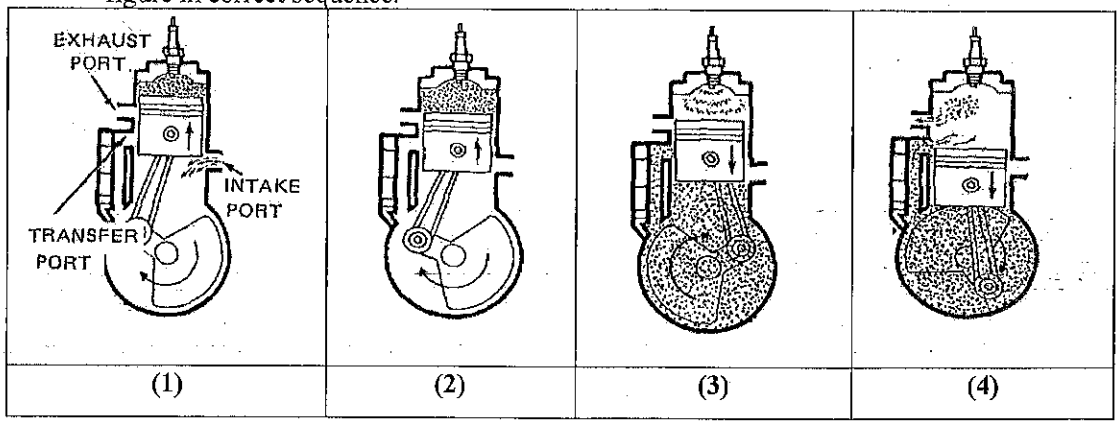


Figure Q2

(b) Referring to a PV diagram of a typical IC engine, briefly explain the parameter Brake Mean Effective Pressure (BMEP).

Question 03

(a) What is meant by "compression ratio"and how does it affects the efficiency of an internal combustion engine?
(b) A four-cylinder-engine has a bore diameter of 155 mm and a stroke length of 170 mm. Calculate the compression ratio of the engine if the clearance volume is 8% of the swept volume.

Question 04

A four-cylinder, four-stroke engine was tested on an engine dynamometer. During the test, the engine consumed 2.127 kg of fuel per second and developed 65.25 Nm at 4200 rev/min. A Morse test is carried out for the engine and the cylinders are cut out in the order of 1, 2, 3, 4 with corresponding brake torques of 104, 102, 98 and 101 Nm, respectively at 4200 rev/min. If the calorific value of the fuel is 45000kJ/kg, and it was observed that 0.3 kg of fuel was consumed per minute,

calculate the following.:

i. Indicated Power
ii. Mechanical Efficiency
iii. Specific Fuel Consumption in kg/kWh
iv. Brake Thermal Efficiency

Question 05

a) Explain the air/fuel mixture preparation inside the carburettorof an engine.
b) Explain the operating principle of a torque converter.

Question 06

a) Identify the components (a – f) of the fuel injection pump shown in the FigureQ6.

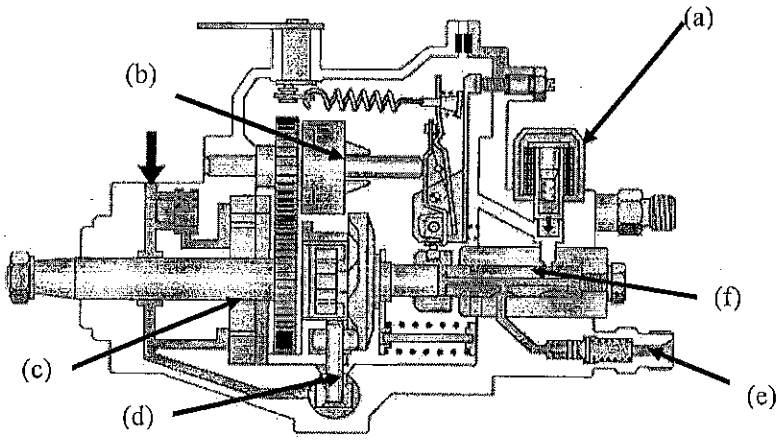


Figure Q6

b) Explain the meaning of cooling load regarding air conditioning systems of automobiles.

Question 07

a) Starting from first principles, derive an expression for the ideal air standard efficiency of an engine in terms of compression ratio and ratio of specific heats.
b) Compare and contrastcarburation and Electronic Fuel Injection in automobile engines.

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