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**First/Second Semester B.E. Degree Examination, June-July 2009**  
**Elements of Mechanical Engineering**

Max. Marks:100

Time: 3 hrs.

- Note : 1. Answer any Five full question, choosing at least two from each part.  
 2. Answer all objectives type questions only in OMR sheet page 5 of the Answer Booklet.  
 3. Answer to the objective type questions on sheets other than OMR will not be valued

**Part A**

- 1 a. Choose the correct answer:
- i) If  $x$  is the weight of dry steam and  $y$  is the weight of water in suspension, then dryness fraction is equal to,  
 A)  $\frac{x}{x+y}$       B)  $\frac{y}{x+y}$       C)  $\frac{x}{x-y}$       D)  $\frac{y}{x-y}$
- ii) The condition of steam in boiler drum is always,  
 A) Dry      B) Wet      C) Saturated      D) Superheated
- iii) Lancashire boiler is of  
 A) Stationary fire tube type      B) Horizontal type  
 C) Natural circulation type      D) All of the above
- iv) The function of the economizer used in boilers is to,  
 A) Economise on fuel  
 B) To heat feed water using extract heat from the exhaust flue gases.  
 C) To increase flue gas temperature      D) To increase the life of boiler
- b. Define energy and distinguish between renewable and non-renewable sources of energy. (04 Marks)
- c. Determine the specific volume and density of 1 kg of steam at a pressure of  $7 \times 10^5$  pa when the condition of steam is i) wet, having dryness fraction 0.9 ii) dry and iii) superheated at  $250^\circ\text{C}$ . If required use the extract of the steam table provided below. (09 Marks)

P	$t_s$	$V_g$
7 bar	437.92 K	0.273341 $\text{m}^3/\text{kg}$

- 2 a. Choose the correct answer
- i) A Kaplan turbine is,  
 A) A high head mixed flow turbine      B) A impulse turbine, outward flow.  
 C) A reaction turbine, outward flow      D) Low head axial flow turbine
- ii) In reaction turbines, the pressure drops,  
 A) in fixed nozzles      B) in moving blades  
 C) in fixed blades      D) in both fixed and moving blades
- iii) An example for tangential flow turbine,  
 A) Pelton wheel      B) Kaplan turbine  
 C) Thomson turbine      D) Modern Francis turbine
- iv) The advantage of closed cycle gas turbine over open cycle gas turbine is,  
 A) No contamination of working fluid.  
 B) Working fluid is continuously circulated in every cycle of operation  
 C) Any fluid with better thermodynamic properties can be used as working fluid.  
 D) All of the above. (04 Marks)

- 2 b. What is compounding of steam turbines? List the types and explain why it should be done. (05 Marks)
- c. Differentiate between the impulse and reaction water turbines. (05 Marks)
- d. What is a gas turbine? What are the essential components of a gas turbine plant? How is a gas turbine different from a steam turbine? (06 Marks)

- 3 a. Choose the correct answer
- i) Piston speed is equal to  
A) Stroke  $\times$  rpm B)  $2 \times$  stroke  $\times$  rpm C)  $4 \times$  stroke  $\times$  rpm D) (stroke  $\times$  rpm)/2
- ii) A two stroke engine is usually identified by,  
A) Size of fly wheel B) Location of fuel tank  
C) Weight of engine D) Absence of valves.
- iii) The process of breaking up of a liquid into fine droplets by spraying is called,  
A) Vaporisation B) Carburetion C) Ionization D) Atomisation
- iv) In a diesel engine, the fuel is ignited by  
A) Spark B) Ignitor  
C) Heat resulting from compressing air that is supplied for combustion  
D) Combustion chamber

b. What are internal and external combustion engines? Give examples. (04 Marks)

c. A single cylinder 4-S I.C. Engine has a swept volume of 6 litres and runs at a rated speed of 300 rpm. At full load, the torque developed was measured with a belt dynamometer whose pulley diameter is 1 m. The tension in the tight side and slack side of the belt is 700 N and 300 N respectively. 4 kg of fuel was consumed in one hour. The indicated mean effective pressure is 6 bar and the C.V. of the fuel is 42000 kJ/kg. Calculate the brake power, IP, mechanical efficiency, indicated thermal efficiency, brake thermal efficiency and brake specific fuel consumption. (12 Marks)

- 4 a. Choose the correct answer.
- i) In S.I. unit, one ton of refrigeration is equal to  
A) 210 kJ/min B) 21 kJ/min C) 420 kJ/min D) 105 kJ/min
- ii) The relative coefficient of performance is,  
A) Actual cop/theoretical cop B) Actual cop  $\times$  theoretical cop  
C) Theoretical cop/actual cop D) Theoretical cop  $\times$  actual cop
- iii) The boiling point of ammonia is  
A)  $+100^{\circ}\text{C}$  B)  $-33.3^{\circ}\text{C}$  C)  $33.3^{\circ}\text{C}$  D)  $0^{\circ}\text{C}$
- iv) A refrigerant should have,  
A) Low viscosity B) Low freezing point  
C) Low boiling point D) All the above (04 Marks)
- b. What is the principle of refrigeration? Name the essential parts of a refrigerator and briefly explain their functions. (08 Marks)
- c. Define the following: i) COP ii) Refrigerating effect iii) Ton of refrigeration iv) Ice making capacity (08 Marks)

### Part B

- 5 a. Choose the correct answer.
- i) The slowest speed in lathe is adopted for following operation:  
A) Turning B) Thread cutting C) Taper turning D) Knurling
- ii) Which of the following drilling machining is used for mass production,  
A) Bench drilling machine B) Radial drilling machine  
C) Pistol drilling machine D) Gang drilling machine
- iii) \_\_\_\_\_ is an internal thread generating operation in a predrilled hole  
A) Reaming B) Boring C) Tapping D) Spot facing
- iv) Twist drills are usually made of  
A) High speed steel B) Diamonds  
C) Carbides D) Mild steel (04 Marks)

- 5 b. Name any five parts of a lathe and state their functions. (05 Marks)
- c. How is a lathe specified and define the following with respect to a lathe i) cutting speed ii) feed iii) Depth of cut. (06 Marks)
- d. Which are the operations, other than drilling that could be performed in a drilling machine? List and briefly explain them. (05 Marks)
- 6 a. Choose the correct answer.
- i) The cutting tool in a milling machine is mounted on  
A) Tool holder B) Arbor C) Column D) Table
- ii) The operation of milling two sides of a workpiece simultaneously is called,  
A) Gang milling B) Climb milling C) End milling D) Straddle milling
- iii) Which of the following is a Natural abrasive,  
A) Corundum B) Carborundum C) Silicon carbide D) Aluminium oxide
- iv) Which of the following is very hard grade.  
A) T-Z B) L-O C) G-K D) A-E (04 Marks)
- b. Differentiate between conventional milling and climb milling. (05 Marks)
- c. What are abrasives? How are they used in metalworking? Explain. (05 Marks)
- d. Briefly discuss the various methods of grinding. (06 Marks)
- 7 a. Choose the correct answer.
- i) Solder is essentially a  
A) tin silver base B) tin lead base C) silver lead base D) bismuth lead base
- ii) The commonly used flux for brazing is,  
A) resin B) soft iron C) borax D)  $\text{NH}_4\text{Cl}$
- iii) Oxygen to acetylene ratio in case of neutral flame is,  
A) 0.8 : 1.0 B) 1 : 1 C) 1.2 : 1 D) 2 : 1
- iv) Carburising flame has  
A) 1 zone B) 2 zones C) 3 zones D) no zone (04 Marks)
- b. Explain briefly the metal joining processes of soldering, brazing and welding. (09 Marks)
- c. Briefly discuss the three types of flames used in gas welding and mention their application. (07 Marks)
- 8 a. Choose the correct answer.
- i) A simple gear train consists of four gears having 30, 40, 50 and 60 teeth respectively. Determine the speed and direction of the last gear, if the first gear makes 600 rpm in clockwise direction.  
A) 300 rpm, Clockwise B) 300 rpm, Anticlockwise  
C) 250 rpm, clockwise D) 250 rpm, Anticlockwise
- ii) The surface of the gear tooth below the pitch surface is called,  
A) bottom tooth B) face C) flank D) tooth depth
- iii) The ratio of pitch circle diameter to number of teeth is,  
A) Pitch B) Circular pitch C) Module D) addendum
- iv) Ratio of belt tensions for a flat open belt drive is given by,  
A)  $\frac{T_1}{T_2} = e^{\mu\theta}$  B)  $\frac{T_1}{T_2} = e^{-\mu\theta}$  C)  $\frac{T_1}{T_2} = e^{\mu\theta/\sin\alpha}$  D)  $\frac{T_1}{T_2} = e^{-\mu\theta/\sin\alpha}$
- where  $\mu$  = coefficient of friction,  $\theta$  = Angle of lap,  $\alpha$  = Semigroove angle (04 Marks)

- 8 b. Two parallel shafts 5 m apart are connected by an open flat belt drive. The diameter of the bigger pulley is 1.5 m and that of the smaller pulley is 0.75 m. The initial tension in the belt is 2.5 kN. The mass of the belt is 1.25 kg/m length, coefficient of friction between the belt and pulley is 0.25 and angle of lap on the smaller pulley is  $170^\circ$ . Find the power transmitted in the following cases when the smaller pulley rotates at 450 rpm.
- i) Neglecting centrifugal tension.    ii) Considering centrifugal tension.    (12 Marks)
- c. Define the following: i) Pitch circle diameter.    ii) Addendum    iii) Circular pitch    iv) Pitch circle diameter.    (04 Marks)

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