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First/Second Semester B.E. Degree Examination, January 2013
Elements of Mechanical Engineering

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, choosing at least two from each part.
 2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.
 3. Answer to objective type questions on sheets other than OMR will not be valued.
 4. Use of steam tables is not permitted.

PART - A

- 1 a.** Choose your answers for the following : (04 Marks)
- i) Hydro energy is considered as _____,
 A) Tidal energy B) Heat energy C) Indirect solar energy D) Ocean energy
- ii) The primary processes of solar energy are:
 A) Heliocemical process B) Helioclectrical process C) Heliothermal process D) All of these
- iii) Lanchashire boiler is a _____ boiler,
 A) Water tube B) Fire tube C) Gas tube D) Air tube
- iv) The temperature at which water starts to boil in static pressure is _____,
 A) Sensible heat B) Saturation temperature C) Wet steam temperature D) Dry steam temperature
- b.** Find the total enthalpy of 0.6 kg of steam with an initial dryness fraction of 0.7 is heated at constant pressure of 7 bar till its temperature rises to 250°C. Assume $C_{ps} = 2.25$ KJ/kgK. From steam table, at 7 bar, $h_f = 679.1$ KJ/kg, $h_{fg} = 2064.9$ KJ/kg, $T_{sat} = 165^\circ\text{C}$. (06 Marks)
- c.** Explain with a neat sketch, the working principle of a Lanchashire boiler. (10 Marks)
- 2 a.** Choose your answers for the following : (04 Marks)
- i) It is an example of reaction turbine,
 A) De-Laval turbine B) Kaplan turbine C) Flow turbine D) Pelton wheel
- ii) Open cycle gas turbine uses _____ as the working substance,
 A) Ammonia B) Nitrogen C) Air D) CO₂
- iii) _____ is example for reaction water turbine,
 A) Pelton wheel B) Francis turbine C) Kaplan turbine D) Both B and C
- iv) Method of improving efficiency by successive stages in a turbine is _____,
 A) Governing B) Compounding C) Supercharging D) Turbocharging
- b.** With a neat sketch explain the working of a open cycle gas turbine. (08 Marks)
- c.** Sketch and explain the working of reaction steam turbine with the help of pressure and velocity profile diagram. (08 Marks)
- 3 a.** Choose your answers for the following : (04 Marks)
- i) The motion of a piston is _____,
 A) Rotary B) Oscillatory C) Rectilinear D) Circular
- ii) Diesel engine is also called as _____,
 A) 4-stroke engine B) 2-stroke engine C) C.I. engine D) S.I. engine
- iii) The power measured in the crankshaft of engine is _____,
 A) Indicated power B) Brake power C) Horse Power D) Torque
- iv) _____ is fed into the diesel engine through inlet valve,
 A) Fuel B) Diesel C) Air fuel mixture D) Air
- b.** With the help of a line diagram, explain the working of a two-stroke petrol engine. (08 Marks)
- c.** A 4-cylinder two-stroke petrol engine develops 30 kW at 2500 rpm. The mean effective pressure on each piston is 8 bar and mechanical efficiency is 80%. Calculate the diameter and stroke of each cylinder, stroke to bore ratio 1.5. Also calculate the specific fuel consumption if brake thermal efficiency is 28%. The calorific value of fuel is 43900 KJ/kg. (08 Marks)
- 4 a.** Choose your answers for the following : (04 Marks)
- i) _____ is the heart of the refrigerator,
 A) Compressor B) Condenser C) Expansion valve D) Evaporator
- ii) The ratio of heat absorbed in a system to work supplied is _____,
 A) Refrigeration effect B) COP C) Ton of refrigeration D) Coding effect
- iii) In a refrigerator exchange of heat takes place in _____,
 A) Condenser B) Evaporator C) Compressor D) Both A and B.
- iv) _____ is the refrigerant used in vapour compression refrigerator,
 A) Ammonia B) Air C) Freon-22 D) Nitrogen

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 4 b. Explain with a neat sketch the working of vapour compression refrigerator. (08 Marks)
 c. With a neat sketch explain the working of a typical room air conditioner. (08 Marks)

PART – B

- 5 a. Choose your answers for the following : (04 Marks)
- _____ object are produced in a engine lathe.
 A) Plane objects B) Curved objects C) Circular objects D) None of these
 - Taper turning is an operation of producing _____ on the work piece.
 A) Tapping B) Reaming C) Taper D) Boring
 - Flute in a twist drill is used for,
 A) Flow of Coolant B) Removal of material C) Easy removal of curl chips D) All of these
 - _____ is not a drilling operation,
 A) Taper turning B) Reaming C) Knurling D) Turning
- b. Explain with a schematic diagram, show how a centre lathe is specified. (08 Marks)
 c. How are counter sinking and counter boring operation done on a drilling machine? Explain with suitable sketches. (08 Marks)
- 6 a. Choose your answers for the following : (04 Marks)
- Milling cutter is a _____,
 A) Multipoint cutting tool B) Abrasive cutter C) Single point cutting tool D) Metal removing machine
 - Milling is a _____,
 A) Metal removal process B) Metal cutting processor C) Metal joint process D) None of these
 - _____ is a natural abrasive mineral consists of aluminium oxide.
 A) Diamond B) Corundum C) Emery D) Aluminium Nitrate
 - Grinding is also called as _____
 A) Turning B) Metal cutting C) Abrasive machining D) Lapping
- b. Sketch and explain the principle and working of a horizontal milling machine. (08 Marks)
 c. With a neat sketch, explain the surface grinding machine. (08 Marks)
- 7 a. Choose your answers for the following : (04 Marks)
- Welding is a _____ process used for metals,
 A) Metallurgical joining B) Forged forming C) Mechanical joining D) Adhesive bonding
 - Gas welding is a _____ method of joining two metals.
 A) Fission B) Fusion C) Gas reaction D) Oxidizing
 - Lubricants are used to reduce the _____ in machines.
 A) Efficiency B) Effectiveness C) Friction D) Torque
 - In thrust bearing the bearing pressure will be _____,
 A) Radial B) Circular C) Axial D) Centrifugal
- b. With a neat sketch, explain the working of oxy-acetylene gas welding. (08 Marks)
 c. List the important properties of good lubricant. (08 Marks)
- 8 a. Choose your answers for the following : (04 Marks)
- The _____ motion is the simplest form of transmitting power with minimum losses.
 A) Rotational B) Rectilinear C) Oscillatory D) None of these
 - _____ is also called as positive drive mechanisms.
 A) Belt drive B) Chain drive C) Gear drive D) Both B and C.
 - _____ type of gear drive is used for transmitting power between two perpendicular shafts.
 A) Bevel gear B) Elliptical gear C) Helical gears D) Spur gear
 - For high power transmission _____ is most suitable power transmission.
 A) Belt drive B) V-belt drive C) Rope drive D) Gear drives
- b. Derive an expression for the length of the belt in an open drive system. (08 Marks)
 c. Two spur gears A and B connect two parallel shafts that are 500 mm apart. Gear A runs at 400 rpm and gear B at 200 rpm. If the circular pitch is 30 mm. Calculate the number of teeth on gears A and B. (08 Marks)