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06EME14/06EME24

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NEW SCHEME

SRINIVAS INSTITUTE OF TECHNOLOGY
LIBRARY, MANGALORE

**First Semester B.E. Degree Examination, Dec. 06 / Jan. 07
Common to all Branches**

①

Elements of Mechanical Engineering

Time: 3 hrs.]

[Max. Marks:100

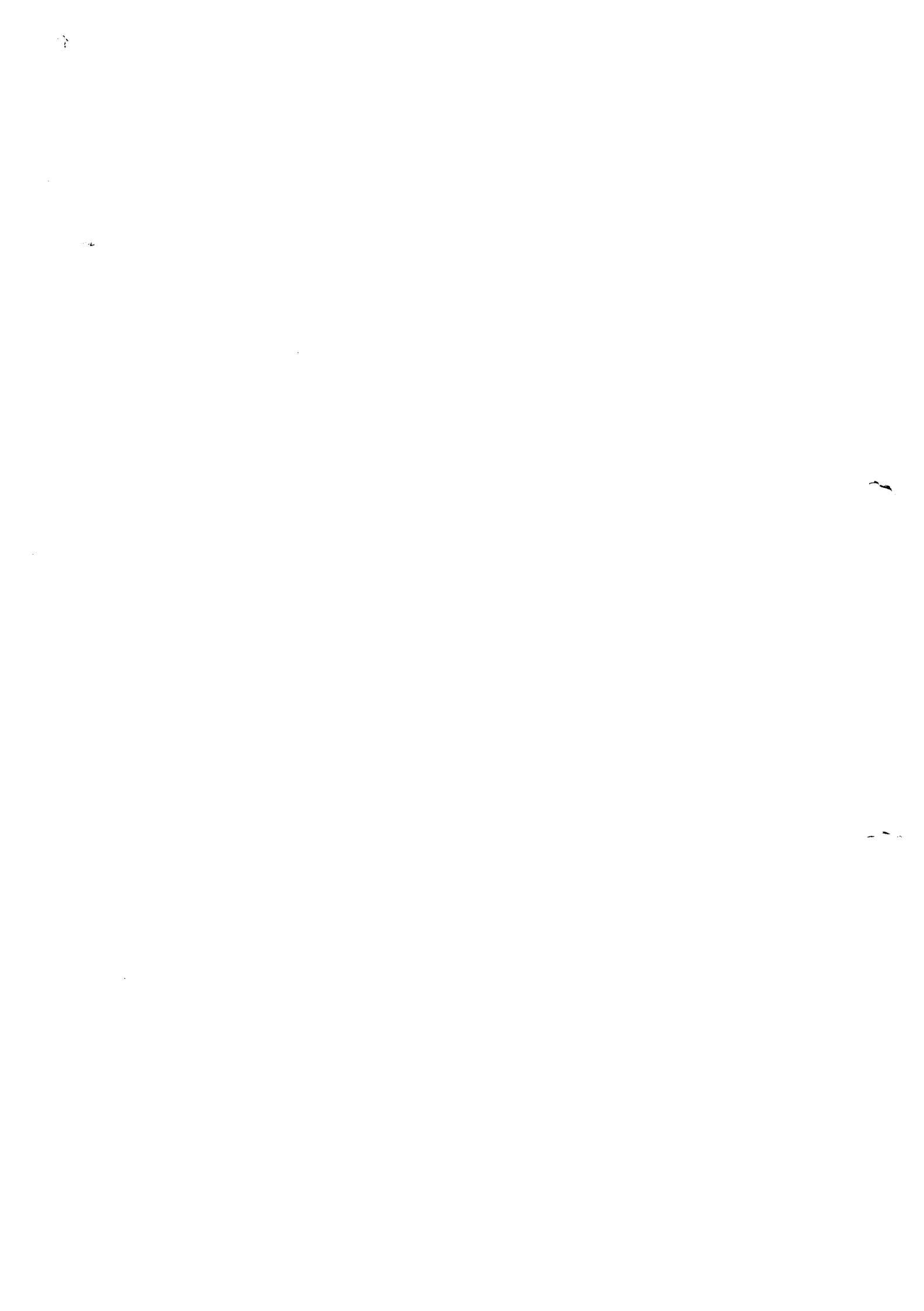
Note: Answer any FIVE full questions picking at least TWO questions from each PART A and PART B.

PART A

- 1 a. What are renewable and non-renewable sources of energy? Discuss the advantages and disadvantages of renewable over conventional sources of energy. (08 Marks)
- b. Define the following terms:
 - i) Dryness fraction ii) Specific volume iii) Latent heat. (06 Marks)
- c. Find the enthalpy of 0.5 kg of steam at a pressure of 10 bar absolute for the following conditions:
 - i) It is 1.5% wet ii) It is dry saturated iii) It is at a temperature of 200°C. Assume specific heat as 2.3 kJ/kgK. (06 Marks)
- 2 a. What is compounding? With a suitable diagram explain velocity compounding. (10 Marks)
- b. Differentiate between impulse and reaction water turbines. (05 Marks)
- c. Explain the working of closed cycle gas turbines. (05 Marks)
- 3 a. What are the different efficiencies of an IC engine? Define each one of them with equations. (06 Marks)
- b. Derive an expression for the thermal efficiency (η_{th}) of an engine working on an Otto-cycle. (09 Marks)
- c. Calculate the brake power output of a single cylinder four stroke petrol engine which is running at a speed of 400 rpm. The load on the brake drum is 24 kg and the spring balance reads 4 kg. The diameter of the brake drum is 600 mm and the rope diameter is 30 mm. (05 Marks)
- 4 a. What are the desirable properties of the refrigerant? (04 Marks)
- b. With a neat sketch explain the construction and working of a vapour absorption refrigeration system. (10 Marks)
- c. Differentiate between refrigeration and air conditioning. (06 Marks)

PART B

- 5 a. With the help of a neat diagram explain the different parts of a lathe. (10 Marks)
- b. Give an account of drilling machine classification and general specification. (10 Marks)
- 6 a. Draw a neat and labeled sketch of a horizontal milling machine. State the function of each part. (08 Marks)
- b. How is a milling machine specified? (04 Marks)
- c. How are abrasives classified? Give examples for each type. (04 Marks)
- d. Compare between up milling and down milling. (04 Marks)
- 7 a. Differentiate between consumable and non consumable electrodes. (05 Marks)
- b. State the advantages of coated electrodes. (05 Marks)
- c. What are the advantages of antifriction bearings? Give their applications. (10 Marks)
- 8 a. Two pulleys are connected by a belt drive. The tensions in the slack side and tight side are 800 N and 1200 N respectively. The diameter of the driven pulley is 1 meter and its speed is 240 rpm. Determine the power transmitted. (10 Marks)
- b. What is a gear train? Explain simple and compound gear trains. (10 Marks)



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First / Second Semester B.E. Degree Examination, July 2007
Common to all Branches

Elements of Mechanical Engineering

Time: 3 hrs.]

[Max. Marks:100

Note : Answer any FIVE full questions choosing atleast two questions from each part.

Part A

- 1 a. Explain any two non-conventional sources of energy. (06 Marks)
- b. Define the terms :
 - i) Dryness fraction of steam.
 - ii) Specific enthalpy.
 - iii) Degree of superheat.
 - iv) Specific volume. (04 Marks)
- c. Explain with a neat sketch Lancashire Boiler. (10 Marks)
- 2 a. What is a Pelton Wheel? Sketch and label the Pelton Wheel. Explain the working principle of Pelton Wheel. (12 Marks)
- b. Differentiate between open cycle gas turbine and closed cycle gas turbine. (08 Marks)
- 3 a. What are heat engines and how they are classified? (03 Marks)
- b. Differentiate clearly between an SI engine and CI engine. Give an example in each case. (05 Marks)
- c. A two stroke diesel engine has a piston diameter of 200 mm and a stroke length 300 mm. The engine has a mean effective pressure of 3.6 bar and a speed of 400 rpm. The effective diameter of brake drum is 1 meter and the load on this is 81 kg. Determine the indicated power, brake power and mechanical efficiency of the engine. (12 Marks)
- 4 a. Mention some commonly used refrigerants and their uses. (05 Marks)
- b. List the uses of refrigeration. (05 Marks)
- c. What are the desirable properties of a refrigerant? (05 Marks)
- d. List the various application of air conditioning. (05 Marks)

Part B

- 5 a. Explain the different tool holding devices on a lathe machine with applications. (10 Marks)
- b. Explain the difference between facing and turning operations. (10 Marks)
- 6 a. Explain up milling and down milling with the help of sketches. (10 Marks)
- b. With the help of sketches explain the principle of surface grinding and cylindrical grinding. (10 Marks)
- 7 a. Name the three types of oxyacetylene flames. Explain the application of each one of them. (10 Marks)
- b. Explain with sketches the operation of sliding and rolling contact bearings with examples of each type. (10 Marks)
- 8 a. Enumerate the advantages and disadvantages of the various kinds of transmission systems. (12 Marks)
- b. What is a transmission system? How do you classify them? (08 Marks)

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06EME14/24

First / Second Semester B.E. Degree Examination, Dec. 07 / Jan. 08
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. Use of steam tables is permitted.

PART A

- 1 a. Describe briefly the ocean thermal energy source and its conversion. (08 Marks)
b. Find the internal energy of 3 kg of steam at 10 bar having a dryness fraction of 0.85. (04 Marks)
c. Describe the principle of operation of Babcock and Wilcox boiler with a neat sketch. (08 Marks)
- 2 a. Explain the principle of working of impulse and reaction turbines. (06 Marks)
b. Explain briefly with a neat sketch the working of Francis turbine. (08 Marks)
c. Explain the working principle of a gas turbine working on closed cycle. (06 Marks)
- 3 a. Explain the principle of operation of two-stroke petrol engine with a neat sketch. (08 Marks)
b. Compare a two-stroke engine with a four-stroke engine. (04 Marks)
c. A single cylinder, four-stroke, diesel engine develops indicated power of 30 kW at 300 rpm. The indicated mean effective pressure is 6.5 bar. The piston speed is 180 m/min. Determine the stroke and diameter of the cylinder. Also find brake specific fuel consumption, if the mechanical efficiency is 80% and indicated thermal efficiency is 30%. Take the calorific value of diesel as 40,000 kJ/kg. (08 Marks)
- 4 a. Define refrigeration and air conditioning. List out the desirable properties of a good refrigerant. (06 Marks)
b. Explain vapour compression refrigeration system with a neat sketch. (08 Marks)
c. Compare vapour compression and vapour absorption refrigeration systems. (06 Marks)

PART B

- 5 a. Write the specification of a lathe indicating this on a simple diagram of a lathe. (06 Marks)
b. List the operations that can be performed on a lathe. Explain taper turning operation by tail stock set-over method. (08 Marks)
c. Explain with a neat sketch, the parts of bench drilling machine. (06 Marks)
- 6 a. With the help of a neat sketch, explain the working of a horizontal milling machine. (08 Marks)
b. Explain the principle of metal removal in a cylindrical grinder with a neat sketch. (06 Marks)
c. With a neat sketch explain the principle of centerless grinding. (06 Marks)
- 7 a. Define soldering, brazing and welding. Differentiate between brazing and welding. (07 Marks)
b. Explain the principle of arc welding with a neat sketch. (07 Marks)
c. Explain Syphon Wick Lubrication System with a neat sketch. (06 Marks)
- 8 a. State the differences between the applications of belt and gear drives. (04 Marks)
b. It is required to drive a shaft A at 600 rpm by a belt using a pulley of 150 mm diameter on another parallel shaft B running at 240 rpm. What would be the diameter of the pulley on the shaft A? Find also the velocity ratio. (08 Marks)
c. Derive an expression to determine the length of belt in an open belt drive. (08 Marks)

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. This is essential for ensuring the integrity of the financial statements and for providing a clear audit trail. The records should be kept up-to-date and should be easily accessible to all relevant parties.

2. The second part of the document outlines the procedures for handling discrepancies. It is important to identify any errors as soon as possible and to investigate the cause of the discrepancy. Once the cause has been identified, the appropriate corrective action should be taken to prevent the error from recurring.

3. The third part of the document discusses the role of the internal control system. This system is designed to prevent and detect errors and fraud. It is important to ensure that the internal control system is effective and that all employees are aware of their responsibilities under the system.

4. The fourth part of the document outlines the requirements for the external audit. The external auditor is responsible for providing an independent opinion on the financial statements. It is important to ensure that the external auditor has access to all relevant information and that the audit process is conducted in a transparent and objective manner.

5. The fifth part of the document discusses the importance of communication. It is important to ensure that all relevant parties are kept informed of the progress of the audit and of any issues that arise. This will help to ensure that the audit is completed in a timely and efficient manner.

6. The sixth part of the document outlines the requirements for the final report. The final report should provide a clear and concise summary of the findings of the audit and should include recommendations for any areas that need improvement. It is important to ensure that the final report is accurate and that it is presented in a professional and clear manner.

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Srinivas Institute of Technology
Library, Bangalore

06EME14/24

First/ Second Semester B.E. Degree Examination, June / July 08

Elements of Mechanical Engineering

Time: 3 hrs.

Max. Marks:100

- Note :** 1. Answer any FIVE full questions, choosing at least two questions from part A and two questions from part B.
2. Thermodynamics data hand book/ data sheet is not allowed.

PART - A

- 1 a. A mixture of saturated water and saturated steam at a temperature of 250°C is contained in a closed vessel of 0.1 m^3 capacity. If the mass of saturated water is 2 kg, find the mass of steam in the vessel. Also find the pressure, specific volume, dryness fraction and the enthalpy of the mixture.

Use the properties of the steam given in the table below.

Saturation Temperature $^{\circ}\text{C}$	Saturation Pressure bar	Specific Enthalpy of Saturated Liquid kJ/kg .k	Specific Enthalpy of saturated Vapour kJ/kg .k	Specific Volume of Saturated Liquid m^3/kg	Specific Volume of Saturated Vapour m^3/kg
250	39.77	1085.8	2800.4	0.0012513	0.05004

- b. Write a neat labeled diagram of Babcock and Wilcox boiler. Show the path of hot gas clearly. (10 Marks)
- 2 a. Write a schematic front view of a Francis turbine and label its parts. State the functions of all its parts. (10 Marks)
- b. What is meant by compounding in steam turbines? Why steam turbines are compounded? (05 Marks)
- c. Describe the working principle of an open cycle gas turbine with the help of a schematic diagram. (05 Marks)
- 3 a. With the help of schematic diagram explain the working of a 4 stroke cycle petrol engine. Show all the processes in a cycle on a PV diagram. (10 Marks)
- b. A gas engine working on a four stroke cycle has a cylinder diameter of 0.25 m and length of stroke of 0.45 m and is running at 180 r /min. Its mechanical efficiency is 80% when mean effective pressure is 6.5 bars. Find indicated power, brake power and friction power. What is the fuel consumption rate (kg /hour) and brake specific fuel consumption (kg /kWh) if the energy content of the fuel used is 42000 kJ /kg and brake thermal efficiency is 25%. (10 Marks)
- 4 a. Define : refrigeration effect, refrigeration capacity and coefficient of performance of a refrigeration system. What is the commonly used unit for capacity of a refrigeration system? Explain how its value is calculated in SI units. (10 Marks)
- b. Explain the working of a vapor compression refrigeration system with the help of a schematic diagram. (10 Marks)

PART – B

- 5 a. List the four elements which specify the size of a lathe and show them on a schematic diagram of a lathe. (10 Marks)
b. Draw a labeled diagram of a radial drilling machine. (10 Marks)
- 6 a. What is milling? Show conventional and climb milling operations on schematic diagrams. List one advantage and one disadvantage of each operation. (10 Marks)
b. Define abrasive. How are they classified? Write a note on bonding materials. (10 Marks)
- 7 a. List five differences between soldering and brazing. (05 Marks)
b. With the help of a schematic diagram explain the working of a tell – tale lubricator. (10 Marks)
c. Sketch a bushed bearing and label its parts. (05 Marks)
- 8 a. Derive an expression for the length of the belt of an open belt drive in terms of radii of pulleys and the centre distance. (10 Marks)
b. List five advantages of gear drives over belt drives. (05 Marks)
c. The velocity ratio of a gear drive is 2. Driving wheel has 16 teeth and turns at 120 r/ min. Find the r/min and the number of teeth on the driven wheel. (05 Marks)

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First/Second Semester B.E. Degree Examination, Dec.08/Jan.09
Elements of Mechanical Engineering

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, selecting at least TWO questions from each part.
2. Answer all objective type questions only in first & second writing pages.
3. Answer for objective type questions shall not be repeated.
4. Use of steam table is not permitted.

PART – A

- 1 a. Choose the correct answer : (04 Marks)
- (i) The centrifugal forces generated by the earth rotation on the far side results in another bulge rise on this side of the earth.
(A) Lunar Tides (B) Earth Quakes (C) Volcanoes (D) None.
- (ii) The process in which, using the principle of photovoltaic effect the solar energy is directly converted in to Electrical energy is
(A) Helio Thermal process (B) Helio Electrical process
(C) Mechanical process (D) None.
- (iii) Babcock and Wilcox Boiler is _____ pressure boiler.
(A) Low (B) High (C) Medium (D) None.
- (iv) Actual energy stored in the steam is called as
(A) Internal latent heat (B) Sensible heat
(C) Internal energy of steam (D) latent heat of Evaporation.
- b. With neat sketch explain working of Lanchashire boiler & also show the path of flue gases [Show all 3 views.] (10 Marks)
- c. What amount of heat would be required to produce 4 kg of steam at a pressure of 6 bar and temperature of 250°C from water at 30°C? Take $C_{pg} = 2.2 \text{ kJ/kgK}$. Specific heat of water = 4.18 kJ/kgK. At 6 bar $h_f = 670.4 \text{ kJ/kg}$, $h_{fg} = 2085 \text{ kJ/kg}$, $T_s = 158.8^\circ\text{C}$ (06 Marks)
- 2 a. Choose the correct answer : (04 Marks)
- (i) The high velocity steam particle enters in the turbine blades where it undergoes
(A) Change in momentum (B) Change in direction of motion
(C) Change in kinetic energy (D) None.
- (ii) Kaplan turbine is a _____ turbine.
(A) Low head reaction (B) High head reaction
(C) Impulse (D) Fire tube
- (iii) Expansion of steam in several stages is called
(A) Open cycle gas turbine (B) Closed cycle gas turbine
(C) Compounding (D) Impulse water turbine.
- (iv) A prime mover in which the heat energy of the steam is transformed in to mechanical energy directly in the form of rotary motion is called
(A) Generator (B) Alternator (C) Steam turbine (D) IC Engine.
- b. With neat sketch explain working of pressure – velocity compounding. (06 Marks)
- c. Differentiate between Impulse and Reaction turbine. (04 Marks)
- d. Explain the working of closed cycle gas turbine with a line diagram. (06 Marks)

- 3 a. Choose the correct answer : (04 Marks)
- In diesel engine heat is supplied at constant
(A) Temperature (B) Pressure (C) Volume (D) Enthalpy
 - In two stroke engine, number of rotation of the crankshaft to complete a cycle
(A) 2 (B) 4 (C) 6 (D) 1
 - In CI engine, in suction stroke _____ is sucked in the cylinder.
(A) Air (B) Air-fuel-mixture (C) Fuel-air-mixture (D) Petrol.
 - In a SI engine, heat is supplied at
(A) Constant pressure (B) Constant temperature
(C) Constant spark (D) Constant volume.
- b. Explain with neat sketch, working of four stroke petrol engine with P-V diagram. (08 Marks)
- c. Following observations are taken during a trial on four stroke diesel engine. Cylinder diameter = 25cm, stroke = 40cm, Speed = 250 rpm, Break load = 70 kg, Break drum diameter = 2 mts, Mean effective pressure = 6 bar, diesel oil consumption = 0.1 m³/min, specific gravity of fuel = 0.78, CV of fuel = 43900 kJ/kgK. Determine (i) IP (ii) BP (iii) FP (iv) Mechanical efficiency (v) Break thermal efficiency (vi) Indicated thermal efficiency. (08 Marks)
- 4 a. Choose the correct answer : (04 Marks)
- Monochloro – difluoro methane is popular refrigerant called
(A) NH₃ (B) Freon (C) Water (D) Carbon
 - One ton of Refrigeration is equal to _____ kJ/sec.
(A) 50 (B) 1.055 (C) 3.5 (D) 210
 - A reverse Carnot cycle is called
(A) Refrigeration cycle (B) Mechanical cycle
(C) Vapour compression cycle (D) Vapour absorption cycle
 - The efficiency of Refrigeration system is expressed by a factor known as
(A) mechanical efficiency (B) Co-efficient of performance
(C) Thermal efficiency (D) Performance ratio.
- b. Explain with neat sketch, working of vapour absorption refrigeration system. (08 Marks)
- c. Explain in brief properties of good refrigerant. (08 Marks)

PART – B

- 5 a. Choose the correct answer : (04 Marks)
- _____ is the process of generating internal threads.
(A) Tapping (B) Turning (C) Knurling (D) None.
 - _____ finishing operation to produce a flat round surface around already drilled hole
(A) Counter sinking (B) Counter boring (C) Spot facing (D) Tapping
 - _____ is the operation of removing excess material from the surface of the cylindrical workpiece.
(A) Taper turning (B) Plain turning (C) Boring (D) Facing
 - _____ is the operation of embossing a diamond shaped pattern on the surface of workpiece.
(A) Taper turning (B) Knurling (C) Threading (D) Eccentric turning
- b. Draw the neat sketch of center lathe and indicate the parts. (08 Marks)
- c. With neat sketch explain the mechanism of Taper turning by swiveling compound rest. (04 Marks)
- d. With neat sketch explain Radial drilling machine. (04 Marks)

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- 6 a. Choose the correct answer : (04 Marks)
- Grinding is also called as
(A) Twisting (B) Honing (C) Lapping (D) Abrasive machining.
 - In Process the workpiece is fed in the same direction as that of cutter's tangential velocity.
(A) Horizontal milling (B) Vertical milling (C) Down milling (D) Up milling
 - is the type of artificial abrasive.
(A) sand stone (B) Corundum (C) Emery (D) Aluminium oxide.
 - Irregular shape of machining is done in
(A) Angular milling (B) Form milling (C) Gang milling (D) End milling
- b. Draw the neat sketch of Horizontal milling machine & explain parts. (08 Marks)
- c. With neat sketch explain centerless grinding process & also cylindrical grinding process (08 Marks)
- 7 a. Choose the correct answer : (04 Marks)
- The hard filler material used in Brazing is
(A) Solder (B) Flux (C) Spelter (D) Electrode
 - Resistance of lubricating oil to flow is
(A) Porosity (B) Electricity (C) Viscosity (D) None.
 - French chalk is
(A) Filler material (B) Flux (C) Lubricant (D) Solder
 - Support provided for rotating shaft is
(A) Bearing (B) Lubricant (C) Axle (D) Hook.
- b. Explain with neat sketch flame characteristics of oxy-acetylene gas welding. (08 Marks)
- c. Explain with neat sketch plummer block (08 Marks)
- 8 a. Choose the correct answer : (04 Marks)
- For converting rotary motion in to rectilinear motion type of gear used is
(A) Spur gear (B) Rack & penion (C) Spiral gear (D) Bevel gear.
 - In an open belt drive, to increase the arc of contact of the belt and driven pulleyis used.
(A) Jockey pulley (B) Fast and loose pulley
(C) Guide pulley (D) Stepped cone pulley
 - The difference between actual speed and that of calculated is
(A) Creep (B) Slip (C) Gear train (D) Speed ratio
 - The ratio of diameters of driver and driven pulley is called
(A) Module (B) Pitch circle diameter (C) Ratio of tension (D) Velocity ratio.
- b. Derive an equation for ratio of tension in belt drive. (08 Marks)
- c. Two pulleys of diameter 300mm and 750mm mounted on two parallel shafts 1.5 mts apart are connected by leather belt 150mm width. If maximum safe tension of belt is 14 N per mm width, determine maximum power transmitted in case of (i) Open belt drive (ii) Cross belt drive. Assume speed of the belt as 540 m/min, $\mu = 0.25$. (08 Marks)

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

Time: 3 hrs.

Max. Marks:100

- 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
- (04 Marks)
- b. Define energy and distinguish between renewable and non-renewable sources of energy.
(07 Marks)
- c. Determine the specific volume and density of 1 kg of steam at a pressure of 7×10^5 pa when the condition of steam is i) wet, having dryness fraction 0.9 ii) dry and iii) superheated at 250°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 m ³ /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 (04 Marks)
- 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°C C) 33.3°C D) 0°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) NH₄Cl
 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 μ = coefficient of friction, θ = Angle of lap, α = 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° . 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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06EME14/24

First/Second Semester B.E. Degree Examination, Dec.09/Jan.10
Elements of Mechanical Engineering

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, selecting at least TWO questions from each part.
2. Answer all objectives type questions only on the OMR sheet, page 5 of the answer booklet.
3. Answer for objective type questions written on pages other than OMR sheet (page 5) will not be valued.
4. Use of steam table is not permitted.

PART - A

1 a. Choose the correct answer:

i) If the specific volume of superheated steam is v_{sup} , specific volume of dry saturated steam at same constant pressure 'P' is v_g , saturation temperature at same pressure 'P' is T_s , and superheated temperature at 'P' is T_{sup} , then v_{sup} is

A) $v_g \cdot \frac{T_s}{T_{sup}}$

B) $v_g \cdot \frac{T_{sup}}{T_s}$

C) $v_g (T_{sup} - T_s)$

D) $v_g (T_{sup} + T_s)$

ii) Blow off valve is used

- A) To reduce steam pressure
B) To stop steam supply
C) To remove sediments collected at the bottom of the boiler
D) To remove excess steam from boiler

iii) Super heater is used

- A) Inside the boiler drum
B) To convert wet steam into dry steam
C) In the path of flue gases to increase volume of steam
D) To increase temperature of steam above saturation temperature.

iv) Economisers are used to:

- A) Conserve water
B) To absorb heat from exit gases by feed water
C) To improve combustion of fuel
D) To convert water into steam.

(04 Marks)

b. Name three renewable and nonrenewable energy sources and compare them for merits and demerits. (08 Marks)

c. Find the enthalpy of 1 kg. of steam at 10 bar absolute, when the steam is

i) Dry saturated

ii) 20% wet

iii) Super heated to 220°C. Assume specific heat of superheated steam as 2.25 kJ/kg K.

Take the following data for the steam at 10 bar:

(04 Marks)

t_s	h_f	h_{fg}	h_g
180°C	762	2030	2792 kJ/kg.

d. Sketch a Lancashire boiler and name its parts (front view only).

(04 Marks)

- 2 a. Choose the correct answer:
- Kaplan turbine is

A) Impulse water turbine	B) Steam turbine
C) Gas turbine	D) Axial flow water turbine
 - Pelton turbine is

A) A reaction turbine	B) Tangential flow turbine
C) Mixed flow turbine	D) A steam turbine
 - A prime mover, which converts heat energy of steam into mechanical energy directly in the form of rotary motion is called

A) Steam engine	B) I.C. engine
C) Steam turbine	D) Generator
 - Most efficient prime mover is

A) I.C. engine	B) Gas turbine
C) Steam engine	D) Steam turbine.
- b. Sketch and explain the working of a Pelton turbine. (08 Marks)
- c. Draw a constant pressure open cycle gas turbine diagram and explain its working. (08 Marks)

- 3 a. Choose the correct answer:
- In 2 – stroke engine, power is developed

A) In every revolution	B) Once in 2 revolutions
C) At half the revolution	D) In every stroke
 - In diesel engine, during suction stroke is sucked in the cylinder

A) Air – fuel mixture	B) Fuel – air mixture
C) Air	D) Diesel
 - Scavenging is employed in

A) 4 – stroke petrol engine	B) 4 – stroke diesel engine
C) 2 – stroke petrol or diesel engine	D) IN all types of engines.
 - Fly wheel is used

A) To increase speed	B) To reduce fuel consumption
C) To make speed uniform	D) To increase torque.
- b. Explain working and construction of 4 – stroke diesel engine with the help of theoretical $p-v$ diagram. (08 Marks)
- c. Following data are collected from a 4 – stroke single cylinder oil engine at full load. Bore = 200 mm, stroke = 280 mm, speed = 300 RPM. Indicated mean effective pressure = 5.6 bar, torque on the brake drum = 250 N.m. Oil consumed 4.2 kg/hour. Calorific value of oil 41,000 kJ/kg. Determine mechanical efficiency, indicated thermal efficiency and brake thermal efficiency. (08 Marks)

- 4 a. Choose the correct answer:
- Condenser is used in a refrigerator

A) To compress the refrigerant	B) To expand the vapour
C) To absorb the heat from refrigerant	D) To transform into vapour.
 - The name of the refrigerant, commonly used in domestic refrigerator, is

A) Water	B) Freon – 12
C) Carbon	D) Ice
 - One ton of refrigeration is equal to kJ/sec

A) 3.5	B) 5.00
C) 1.55	D) 50

- iv) As a property of a good refrigerant, it should have
 - A) Low saturation point
 - B) High saturation point
 - C) Low thermal conductivity
 - D) Low enthalpy of evaporation.

(04 Marks)
- b. Name the various parts of a vapour compression refrigerator and briefly explain with a flow diagram their functions. (08 Marks)
- c. Explain the construction and working of a room air conditioner. (08 Marks)

PART – B

- 5 a. Choose the correct answer:
 - i) Reaming is the process of
 - A) Enlarging a drilled hole
 - B) Finishing a drilled hole
 - C) Operation done on lathe
 - D) Operation after facing
 - ii) is the name of the part to hold a cylindrical work piece in the lathe
 - A) Tailstock
 - B) Tool post
 - C) 3 – JAW chuck
 - D) Head stock
 - iii) In radial drilling machine..... is moved for drilling operation
 - A) Column
 - B) Table
 - C) Arm
 - D) Handle
 - iv) is the operation of embossing a diamond shaped pattern on the surface of a work piece on lathe
 - A) Taper turning
 - B) Knurling
 - C) Eccentric turning
 - D) Engraving.

(04 Marks)
- b. Explain the functions of various important parts of a centre lathe with a neat sketch. (08 Marks)
- c. Explain with the help of sketches four machining operations that can be carried out in a drilling machine. (08 Marks)

- 6 a. Choose the correct answer:
 - i) is the abrasive material used in grinding wheels
 - A) Aluminium chloride
 - B) Calcium carbonate
 - C) Silicon carbide
 - D) Tungsten carbide
 - ii) Grinding is also known as
 - A) Lapping
 - B) Honing
 - C) Abrasive machining
 - D) Reaming.
 - iii) is known as natural abrasive
 - A) Granite
 - B) Magnetite
 - C) Corundum
 - D) Ferrite
 - iv) Milling cutter is mounted on
 - A) Column
 - B) Spindle
 - C) Arbor
 - D) Shaft.

(04 Marks)
- b. Draw a neat sketch of a horizontal milling machine and explain various milling operations on the machine. (08 Marks)
- c. Sketch a plain centre type cylindrical grinding machine and explain the working of the machine. (08 Marks)

- 7 a. Choose the correct answer:
- Spelter is used in for joining dissimilar metals with the help of heating'

A) Arc welding	B) Soldering
C) Brazing	D) Forge welding
 - is the important property of a lubricant

A) Low fire point	B) High viscosity
C) Lightness	D) To be volatile
 - Plummer block is a name of

A) Horizontal bearing	B) Vertical bearing
C) Roller bearing	D) Collar bearing
 - Bearing material is made of

A) Mild steel	B) Tin
C) Zinc	D) Bronze.
- b. Sketch a ball bearing, name the parts and explain their function. (04 Marks)
- c. Sketch a wick feed lubricator and explain its working. (04 Marks)
- d. What are antifriction bearings? State advantages and disadvantages of them over other types of bearings. (08 Marks)
- 8 a. Choose the correct answer:
- is used to transmit power between two perpendicular shafts

A) Spur gear	B) Helical gear
C) Herringbone gear	D) Bevel gear
 - is used to convert rotary motion to linear motion

A) Spur gear	B) Rack and pinion
C) Helical gear	D) Worm and worm gear
 - To stop the machine temporarily in a belt drive, is used

A) Guide pulley	B) Stepped cone pulley
C) Jockey pulley	D) Fast and loose pulley
 - In an open belt drive, ratio of pulley diameters is equal to

A) Inverse of speed ratio	B) Speed ratio
C) Ratio of tensions	D) None of these.
- b. Derive an expression for length of belt in open belt drive. (08 Marks)
- c. A gear train consists of four gears A, B, C and D of 20, 25, 50 and 75 teeth respectively. A meshes with C and B is a compound gear with C. B meshes with D. If A has a speed of 300 RPM what is the speed of D? Sketch the gear train. (08 Marks)

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06EME14/24

First / Second Semester B.E. Degree Examination, May/June 2010
Elements of Mechanical Engineering

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer any FIVE full questions, selecting atleast TWO questions from each part.**
2. Answer all objective type questions only in 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 the correct answer (04 Marks)
- i) The periodic rise and fall of open sea water is known as
A) Tides B) Waves C) Ocean D) Jumping
 - ii) Solar energy source is a _____
A) Non conventional energy source B) Conventional energy source
C) Mechanical energy source D) Electrical energy source
 - iii) The sum of internal energy and work done is known as _____
A) Wet steam B) Enthalpy C) Dry steam D) Super heat
 - iv) Babcock and Wilcox boiler is an example of _____ boiler
A) Fire tube B) Water tube C) Air tube D) Gas tube
- b. List the various sources of energy with minimum two examples for each source. (06 Marks)
- c. With neat sketches, explain the constructional features and operation of Lancashire boiler. (10 Marks)
- 2 a. Choose the correct answer (04 Marks)
- i) The turbine in which steam expands completely in nozzles is called _____
A) Impulse turbine B) Francis turbine
C) Reaction turbine D) Flow turbine
 - ii) Francis turbine is an example of _____
A) Impulse turbine B) Reaction turbine
C) Gas turbine D) None of these
 - iii) A prime mover in which the heat energy of the steam is transformed into mechanical energy directly in the form of rotary motion is called _____
A) Steam turbine B) Water turbine
C) Generators D) Alternator
 - iv) The thermal efficiency of open cycle gas turbine is _____ compared to close cycle gas turbine.
A) Low B) High C) Very high D) Medium
- b. Differentiate between closed cycle and open cycle gas turbine. (06 Marks)
- c. With a neat sketch, explain the construction and working of a Kaplan turbine. What are its advantages and disadvantages? (10 Marks)

Important Note : 1. On completing your answers, carefully draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, numerical or equations written eg. 42+8 = 50, should be treated as malpractice.

- 3 a. Choose the correct answer (04 Marks)
- The heart of an engine is _____
 A) Valves B) Connecting rod
 C) Fly wheel D) Cylinder
 - _____ is the thermodynamic cycle which is not followed by an I.C. engine.
 A) Diesel cycle B) Brayton cycle
 C) Otto cycle D) Dual cycle
 - _____ is the type of motion of the connecting rod in an I.C. engine
 A) Oscillation B) Reciprocation C) Rotation D) Vibration
 - In a 2 stroke cycle engine, there is a power stroke every _____ revolutions of the crank shaft.
 A) Two B) Four C) One D) Three
- b. With neat sketches, explain the working of a four stroke petrol engine. (06 Marks)
- c. A four stroke diesel engine has a piston diameter 250mm and stroke 400mm. The mean effective pressure is 4 bar and the speed is 500 rpm. The diameter of the brake drum is 1000mm and the effective brake load is 400N. Find indicated power, Brake power and frictional power. (10 Marks)
- 4 a. Choose the correct answer (04 Marks)
- One ton of refrigeration is = _____ kW
 A) 1.5 B) 2.5 C) 3.5 D) 4.5
 - A vapour absorption system works solely on _____
 A) Mechanical energy B) Both mechanical and thermal energy
 C) Thermal energy D) None of these
 - Mono chloro – difluoro methane is a popular refrigerant called
 A) Amonia B) Water C) Freon 22 D) Oxygen
 - In a refrigerator, heat exchange takes place in _____
 A) Compressor B) Throttle valve C) Condenser D) None of these
- b. What are the desirable properties of refrigerant? (06 Marks)
- c. With a neat sketch, explain the construction and working of a vapour absorption refrigeration system. (10 Marks)

PART - B

- 5 a. Choose the correct answer (04 Marks)
- In a lathe _____ operation cannot be performed
 A) Thread cutting B) Reaming C) Boring D) Planing
 - Knurling is an operation of producing
 A) Flat surfaces B) Screw threads
 C) Diamond shaped pattern D) Conical surfaces
 - _____ is the process of generating internal threads
 A) Tapping B) Turning C) Milling D) Knurling
 - _____ is the finishing operation to produce a flat round surface around already drilled hole.
 A) Spot facing B) Tapping C) Counter sinking D) None of these
- b. Draw a neat sketch of a centre lathe and label its main parts. (06 Marks)
- c. Explain the following drilling machine operations : (10 Marks)
- Reaming
 - Boring
 - Tapping
 - Counter sinking.

- 6 a. Choose the correct answer (04 Marks)
- The device used to support the cutting tool in milling machine is called _____
A) Arbor B) Saddle C) Table D) Column
 - Milling machine can be specified by _____
A) Cutter size B) Table size C) Machine height D) None of these
 - Grinding is also called _____
A) Abrasive machining B) Twisting
C) Lapping D) Honing
 - The abrasive used to grind marbles is _____
A) Corundum B) Carborundum C) SiC D) Al_2O_3
- b. Draw a neat sketch of a column and knee type vertical milling machine and explain the parts. (06 Marks)
- c. With a neat sketch, explain the principle of centreless grinding machine. (10 Marks)
- 7 a. Choose the correct answer (04 Marks)
- The temperature range in Arc welding process is about _____
A) 2000 to 3000 $^{\circ}C$ B) 3000 to 4000 $^{\circ}C$
C) 4000 to 5000 $^{\circ}C$ D) 5000 – 6000 $^{\circ}C$
 - The filler material used in Brazing is _____
A) Electrode B) Spelter C) Solder D) Flux
 - In D.C welding, _____ is used
A) Transformer B) Generator
C) Generator - Transformer D) None of these
 - Grease is an example of _____
A) Solid lubricant B) Liquid lubricant
C) Semi liquid lubricant D) None of these
- b. Distinguish among soldering, brazing and welding. (06 Marks)
- c. State the purposes of lubrication. Explain needle lubricator. (06 Marks)
- d. Write a note on Anti – friction bearing (04 Marks)
- 8 a. Choose the correct answer (04 Marks)
- _____ is a positive drive system.
A) Belt drive B) Gear drive C) Rope drive D) None of these
 - The normally used gear tooth profiles are _____
A) Involute and Cycloidal B) Involute and Catenary
C) Spiral and Catenary D) Cycloidal and Spiral
 - Rack and pinion arrangement is used to _____
A) Convert linear motion to rotary motion
B) Convert rotary motion to angular motion.
C) Convert linear motion to angular motion
D) None of these
 - When the axes of the driver and follower shafts are intersecting, _____ gears are used.
A) Bevel B) Spiral C) Helical D) Elliptical
- b. With neat sketches explain : i) Spur gear ii) Helical gear iii) Bevel gear. (09 Marks)
- c. The sum of diameters of two pulleys is 1000mm and the pulleys are connected by a belt. If the pulleys rotate at 600 rpm and 1800rpm, determine the diameter of each pulley and length of the belt in case of a belt drive system. Take centre distance between the two pulleys $C = 5$ mts. (07 Marks)

