



SLR-TX – 4

Seat No.	
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Set	P
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**F.E. (Part – I) (CBCS) Examination, 2018  
BASIC MECHANICAL ENGINEERING (New)**

Day and Date : Monday, 10-12-2018  
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

**Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.

2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

**MCQ/Objective Type Questions**

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

**(14×1=14)**

- 1) Pollution in the form of smoke and ash is associated with
  - a) Thermal power plant
  - b) Hydro power plant
  - c) Nuclear power plant
  - d) Diesel power plant
- 2) During a cycle the heat transfer are given as 120 kJ, – 60 kJ, – 48 kJ and 12 kJ. The network transfer of the cycle is
  - a) 60 kJ
  - b) 24 kJ
  - c) 120 kJ
  - d) 44 kJ
- 3) Change in internal energy is zero in
  - a) Isochoric process
  - b) Isobaric process
  - c) Isothermal process
  - d) Adiabatic process
- 4) Specific heat is amount of heat required to raise the temperature
  - a) By 5 degree of substance
  - b) By unit degree of unit mass
  - c) By 10 degree of unit mass
  - d) None of the above
- 5) In split air-conditioner
  - a) All components are placed in compact box
  - b) Compressor and condenser are placed outside the room
  - c) Compressor and condenser are placed inside the room
  - d) Evaporator is outside the room

P.T.O.



- 6) A surge tank is used to
- a) Increase pressure energy of water
  - b) Increase kinetic energy of water
  - c) Prevent water hammer effect
  - d) None of the above
- 7) Draft tube is used in
- a) Reaction water turbines
  - b) Impulse water turbines
  - c) Steam turbines
  - d) None of the above
- 8) When two pulleys of different diameters are connected by open belt, the angle of contact is considered must be on
- a) smaller pulley
  - b) larger pulley
  - c) average of two pulley
  - d) none
- 9) Enhancing the beauty and symmetry of product is taken in following design
- a) Ergonomic consideration
  - b) Aesthetic consideration
  - c) Refrigeration
  - d) Air conditioning
- 10) The property of material which enables it to resist fracture due to high impact load called
- a) Toughness
  - b) Hardness
  - c) Malleability
  - d) Ductility
- 11) In four stroke engine one power stroke is obtained in
- a) one revolution of crankshaft
  - b) two revolution of crankshaft
  - c) four revolution of crankshaft
  - d) none
- 12) Area under PV diagram
- a) Entropy
  - b) Heat
  - c) Work
  - d) Pressure
- 13) Facing operation can be performed on
- a) Lathe machine
  - b) Drilling machine
  - c) Both of these
  - d) None of these
- 14) Which joining process is carried out above 450°C ?
- a) Soldering
  - b) Brazing
  - c) Both of these
  - d) None of these
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Seat No.	
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**F.E. (Part – I) (CBCS) Examination, 2018  
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Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :**
- 1) **Neat** diagrams must be drawn **whenever** necessary.
  - 2) Make suitable assumptions, if necessary and mention them **clearly**.
  - 3) Figures to the **right** indicate **full** marks.
  - 4) Q. No. 2 and Q. No. 4 are short answer type question.
  - 5) Q. No. 3 and Q. No. 5 are long answer type question.
  - 6) **Use** of log tables and non-programmable single memory calculator is **allowed**.

SECTION – I

2. Answer **any five** of the following :

**15**

- a) Explain types of thermodynamic systems and give example of each.
- b) A system undergoes a cycle consisting of 4 processes. The heat and work transfer are tabulated below. Prove that the table is consistent with first law of thermodynamics. Determine change in internal energy for each process.

Process	Q(kJ)	W(kN – m)
1 – 2	1770	525
2 – 3	– 1650	0
3 – 4	– 900	– 305
4 – 1	1000	0

- c) Draw a line diagram of Vapour Compression Refrigeration System (VCRS). Mention the names of different processes.
- d) Derive an expression for work done in isothermal process. What will be the change in internal energy for isothermal process ?
- e) State applications of pumps and compressors.
- f) Explain in brief working of double acting reciprocating pump.
- g) Draw a neat sketch of Boiling Water Reactor (BWR) and label the parts.

3. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) :

- a) The inlet and exit conditions of steam passing through a nozzle are  $h_1 = 2880$  kJ/kg,  $V_1 = 60$  m/s and  $h_2 = 2770$  kJ/kg. Neglecting heat loss from the nozzle and assuming nozzle to be horizontal, find exit velocity of steam. Also find out exit area of the nozzle, if specific volume at outlet is  $0.5$  m<sup>3</sup>/kg, specific volume at inlet is  $0.187$  m<sup>3</sup>/kg and inlet area is  $1000$  cm<sup>2</sup>.

**5**

**Set P**



- b) With the help of neat sketch explain working of hydroelectric power plant. **5**
- c) 0.2 kg of air at 5 bar and 200°C expands adiabatically to a final pressure of 1.2 bar. Determine work done and change in internal energy during the process. Take  $R = 287 \text{ J/kgK}$  and  $\gamma = 1.4$  for air. **4**
- d) Explain with neat sketch working of Francis turbine. **4**
- e) With the help of neat sketch explain working of steam (thermal) power plant. **4**
- f) A fluid system undergoes a non-flow frictionless process following the pressure volume relation as  $p = (4.5/v) + 2$  where 'p' is in bar and 'v' is in  $\text{m}^3$ . During the process, the volume changes from  $0.12 \text{ m}^3$  to  $0.04 \text{ m}^3$ . The system rejects 40 kJ of heat. Determine the work done and change in internal energy. **4**

## SECTION – II

4. Answer **any five** of the following : **(5×3=15)**
- Differentiate between external combustion engines and internal combustion engines.
  - Distinguish between flat belt and v-belt.
  - What are the advantages and disadvantages of gear drives ?
  - What do you mean by design for safety, design for economy and design for compactness ?
  - State various steps adopted in design process.
  - Write a note on classification of IC engines.
  - Differentiate between gas welding and arc welding processes.
5. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) :
- Two pulleys having diameters 2 m and 1.5 m are separated by a distance of 5 m. The initial tension in the belt is 3 kN. The co-efficient of friction between the belt and the pulley is 0.3. Calculate the power transmitted by the open belt, when the smaller pulley rotates at 200 rpm. **5**
  - Explain various operations performed on lathe. **5**
  - A diesel engine has a compression ratio of 15 and heat addition at constant pressure takes place at 6% of the stroke. Find the air standard efficiency of the engine. Take  $\gamma = 1.4$ . **4**
  - What are the various modes of failure of mechanical components ? **4**
  - Explain with neat sketch the resistance spot welding process. **4**
  - Write a note on brazing process. **4**



Seat No.	
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Set Q
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2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**

**MCQ/Objective Type Questions**

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

(14×1=14)

- 1) When two pulleys of different diameters are connected by open belt, the angle of contact is considered must be on
  - a) smaller pulley
  - b) larger pulley
  - c) average of two pulley
  - d) none
- 2) Enhancing the beauty and symmetry of product is taken in following design
  - a) Ergonomic consideration
  - b) Aesthetic consideration
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- 3) The property of material which enables it to resist fracture due to high impact load called
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  - c) Work
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  - c) Both of these
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P.T.O.





Seat No.	
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SECTION – I

2. Answer **any five** of the following :

**15**

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- c) Draw a line diagram of Vapour Compression Refrigeration System (VCRS). Mention the names of different processes.
- d) Derive an expression for work done in isothermal process. What will be the change in internal energy for isothermal process ?
- e) State applications of pumps and compressors.
- f) Explain in brief working of double acting reciprocating pump.
- g) Draw a neat sketch of Boiling Water Reactor (BWR) and label the parts.

3. Solve **any one** out of (a) and (b) and solve **any two** out of (c) to (f) :

- a) The inlet and exit conditions of steam passing through a nozzle are  $h_1 = 2880$  kJ/kg,  $V_1 = 60$  m/s and  $h_2 = 2770$  kJ/kg. Neglecting heat loss from the nozzle and assuming nozzle to be horizontal, find exit velocity of steam. Also find out exit area of the nozzle, if specific volume at outlet is  $0.5$  m<sup>3</sup>/kg, specific volume at inlet is  $0.187$  m<sup>3</sup>/kg and inlet area is  $1000$  cm<sup>2</sup>.

**5**

**Set Q**



- b) With the help of neat sketch explain working of hydroelectric power plant. 5
- c) 0.2 kg of air at 5 bar and 200°C expands adiabatically to a final pressure of 1.2 bar. Determine work done and change in internal energy during the process. Take  $R = 287 \text{ J/kgK}$  and  $\gamma = 1.4$  for air. 4
- d) Explain with neat sketch working of Francis turbine. 4
- e) With the help of neat sketch explain working of steam (thermal) power plant. 4
- f) A fluid system undergoes a non-flow frictionless process following the pressure volume relation as  $p = (4.5/v) + 2$  where 'p' is in bar and 'v' is in  $\text{m}^3$ . During the process, the volume changes from  $0.12 \text{ m}^3$  to  $0.04 \text{ m}^3$ . The system rejects 40 kJ of heat. Determine the work done and change in internal energy. 4

## SECTION – II

4. Answer **any five** of the following : (5×3=15)
- Differentiate between external combustion engines and internal combustion engines.
  - Distinguish between flat belt and v-belt.
  - What are the advantages and disadvantages of gear drives ?
  - What do you mean by design for safety, design for economy and design for compactness ?
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  - Explain various operations performed on lathe. 5
  - A diesel engine has a compression ratio of 15 and heat addition at constant pressure takes place at 6% of the stroke. Find the air standard efficiency of the engine. Take  $\gamma = 1.4$ . 4
  - What are the various modes of failure of mechanical components ? 4
  - Explain with neat sketch the resistance spot welding process. 4
  - Write a note on brazing process. 4





SLR-TX – 4

Seat No.	
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BASIC MECHANICAL ENGINEERING (New)**

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**MCQ/Objective Type Questions**

Duration : 30 Minutes

Marks : 14

1. Choose the correct answer :

**(14×1=14)**

- 1) In split air-conditioner
  - a) All components are placed in compact box
  - b) Compressor and condenser are placed outside the room
  - c) Compressor and condenser are placed inside the room
  - d) Evaporator is outside the room
- 2) A surge tank is used to
  - a) Increase pressure energy of water
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- 3) Draft tube is used in
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  - c) Refrigeration
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P.T.O.





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SECTION – I

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**5**

**Set R**



- b) With the help of neat sketch explain working of hydroelectric power plant. **5**
- c) 0.2 kg of air at 5 bar and 200°C expands adiabatically to a final pressure of 1.2 bar. Determine work done and change in internal energy during the process. Take  $R = 287 \text{ J/kgK}$  and  $\gamma = 1.4$  for air. **4**
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- f) A fluid system undergoes a non-flow frictionless process following the pressure volume relation as  $p = (4.5/v) + 2$  where 'p' is in bar and 'v' is in  $\text{m}^3$ . During the process, the volume changes from  $0.12 \text{ m}^3$  to  $0.04 \text{ m}^3$ . The system rejects 40 kJ of heat. Determine the work done and change in internal energy. **4**

## SECTION – II

4. Answer **any five** of the following : **(5×3=15)**
- Differentiate between external combustion engines and internal combustion engines.
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  - Explain various operations performed on lathe. **5**
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Set R



SLR-TX – 4

Seat No.	
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- 6) Pollution in the form of smoke and ash is associated with
  - a) Thermal power plant
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  - c) Nuclear power plant
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P.T.O.



- 7) During a cycle the heat transfer are given as 120 kJ, – 60 kJ, – 48 kJ and 12 kJ. The network transfer of the cycle is  
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SECTION – I

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**5**

**Set S**



- b) With the help of neat sketch explain working of hydroelectric power plant. **5**
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- Two pulleys having diameters 2 m and 1.5 m are separated by a distance of 5 m. The initial tension in the belt is 3 kN. The co-efficient of friction between the belt and the pulley is 0.3. Calculate the power transmitted by the open belt, when the smaller pulley rotates at 200 rpm. **5**
  - Explain various operations performed on lathe. **5**
  - A diesel engine has a compression ratio of 15 and heat addition at constant pressure takes place at 6% of the stroke. Find the air standard efficiency of the engine. Take  $\gamma = 1.4$ . **4**
  - What are the various modes of failure of mechanical components ? **4**
  - Explain with neat sketch the resistance spot welding process. **4**
  - Write a note on brazing process. **4**