

**B.TECH. SEM -II (CHEMICAL/ CIVIL/ ELECTRICAL/  
MECHANICAL/ PRODUCTION/ COMPUTER/ INFO. TECH./  
ELECTRONICS / BIO MEDICAL / E & TC) 2014 COURSE (CBCS)  
: SUMMER - 2018**

**SUBJECT: FUNDAMENTALS OF MECHANICAL ENGINEERING**

**Day: Wednesday**  
**Date: 06/06/2018**

**Time: 10.00 AM TO 01.00 PM**  
**Max. Marks: 60**

**S-2018-2215**

**N.B:**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable **CALCULATOR** is allowed.
- 4) Neat diagram must be drawn **WHEREVER** necessary.
- 5) Assume suitable data **WHEREVER** necessary.

**Q.1 a)** List and explain in brief some of the thermodynamic devices which are used in engineering practices. **(05)**

**b)** A steam turbine receives steam at the rate of 22700 kg/hr, when it is delivering 500 Kw POWER. The inlet and outlet velocities of steam are 75m/sec and 300 m/sec respectively. The inlet pipe is 3m above the exhaust pipe. Neglecting the heat loss from the turbine, find the change in enthalpy per kg of steam. **(05)**

**OR**

**Q.1 a)** What is perpetual motion machine of the first kind and second kind? **(05)**

**b)** At the inlet to a convergent-divergent nozzle the enthalpy of the fluid passing is 280 kJ/kg and the velocity is 55m/sec. At the discharge end, the enthalpy is 2757kJ/kg. The nozzle is horizontal and the heat loss during flow is negligible. Find **(05)**

- i) Velocity of the fluid at the exist of the nozzle.
- ii) If the inlet area is  $0.1\text{m}^2$  and the specific volume at the inlet is  $0.187\text{m}^3/\text{kg}$ , find the mass flow rate of the fluid.

**Q.2 a)** With a neat sketch explain working of four stroke diesel engine. **(05)**

**b)** Write a short note on "Window air Conditioner". **(05)**

**OR**

**Q.2 a)** How centrifugal pump works? Stare applications of centrifugal pump. **(05)**

**b)** Explain working of vane type compressor. **(05)**

**Q.3 a)** Draw a neat sketch of nuclear power plant and name its various components. **(05)**

**b)** A wire 1.5 mm in diameter and 150 mm long is submerged in water at atmospheric pressure, an electric current is passed through the wire and is increased until the water boils at  $100^{\circ}\text{C}$ . Under the condition if convective heat transfer coefficient is  $4500\text{ W/m}^2\text{ }^{\circ}\text{C}$  find how much electric power must be supplied to the wire to maintain the wire surface at  $120^{\circ}\text{C}$ ? **(05)**

**OR**

**Q.3 a)** With the help of block diagram, explain working of biogas plant. **(05)**

**b)** Consider a slab of thickness  $L=0.25\text{M}$ . One surface is kept at  $100^{\circ}\text{C}$  and the other surface at  $0^{\circ}\text{C}$ . Determine the net flux across the slab if the slab is made from pure copper. Thermal conductivity of copper may be taken as  $387.6\text{ W/mk}$ . **(05)**

**P.T.O.**

- Q.4 a)** Explain the phenomenon of capillarity. Obtain an expression for capillary fall. (05)
- b)** If the velocity distribution over a plate is given by  $u=Y-y$  in which  $u$  is velocity in m/s at a distance of  $y$  meters above the plate, determine the shear stress at  $y=0.1$  m when Co-efficient of viscosity is  $0.86\text{N}\cdot\text{S}/\text{m}^2$  (05)

**OR**

- Q.4 a)** Define smart materials and its selection criterion. List the applications of smart materials. (05)
- b)** A soap bubble 50mm diameter has inside pressure of  $20\text{N}/\text{m}^2$  above atmosphere. Calculate the tension in the soap film. (05)
- Q.5 a)** How do you differentiate between bush and ball bearings? (05)
- b)** Draw neat sketches of the following gears and state their applications (05)
- i) Bevel gear                      ii) Worm and worm wheel

**OR**

- Q.5 a)** How Geneva mechanism works? State its applications. (05)
- b)** With neat sketch explain working of universal coupling. (05)
- Q.6 a)** List the different types of lathe cutting tools and state application of each of these. (05)
- b)** What is the role of following machines in the manufacturing processes? (05)
- i) Grinding machine                      ii) Milling machine
- iii) Power Saw

**OR**

- Q.6 a)** With the help of sketch explain following operations performed on drilling machine. (05)
- i) Counter boring                      ii) Reaming                      iii) Tapping
- b)** Explain working principle of forging and state the products manufactured from forging. (05)

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