Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Re-Examination - June 2019 Examinations

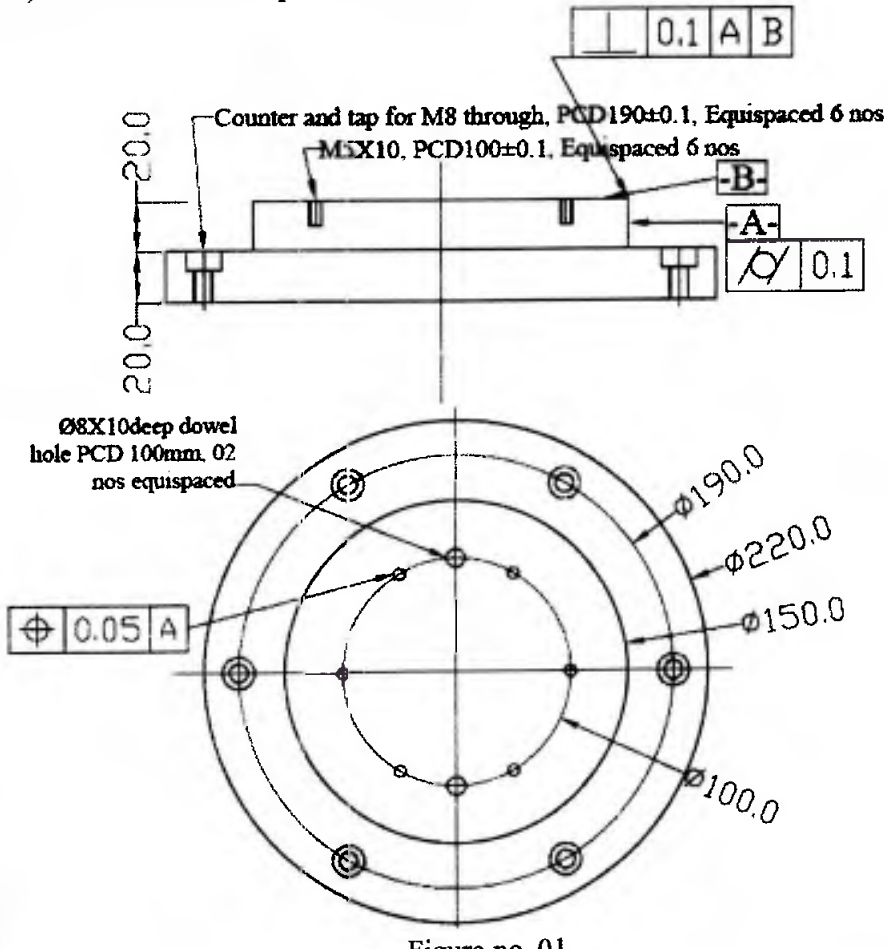
Program: Mechanical Engineering | Duration: 03 hour

Course Code: PCC-BTM306 | Maximum Points: 100 marks

Course Name: **Manufacturing Science** | Semester: **III**

Notes: 1.Questions number 01 is compulsory.
2. Solve any four questions out of remaining four main questions.
2. Draw neat schematic diagrams wherever is necessary, **highlight** important points.
3. Assume suitable data if necessary and mention it.

Q. No.	Questions	Marks	CO	BL	PI
Q1 A	Explain conventional abrasive grinding wheel compositional *specification*? Explain each alpha numeric terms in details which describes grinding wheel?	10	2, 4	3,2	2.1 .2
Q1 B	Certain foundry industry want to manufacture axisymmetric hollow bimetallic pipe with very less impurities/defect accepted at its inner most diameter surface in mass quantity. Suggest a particular casting technique for this application? Explain that process with the help of important points of process? What are different type of molding sand and additives can be used for sand mold preparation?	10	2, 3	3,5	2.1 .2
Q2 A	Calculate power required to drill 16 mm diameter hole in EN42 steel material at feed of 0.30 mm/rev, speed of 400 RPM. Determine volume of metal removed per unit energy? Note- Torque required for drilling the hole in EN42 material is given by, $T=C \times f^{0.87} \times D^{0.25}$. where 'C=0.573' is constant for for material [8M]. Draw well labeled sketch of work piece and drill tool indicating working principle of drilling operation [2M]?	10	4	2	1.4 .1
Q2 B	Draw and explain parts/structure of Tool room lathe machine?	10	4	1,2	1.3 .1
Q3 A	Explain [2M] Gas metal arc welding process with the help of its set up neat schematic sketch [2M]? Give its application [1M]? With the help of graph/sketch, explain how one can able to select optimum welding speed for a particular set of work-piece to be joined.	10	3	3,4	2.4 .2
Q3 B	A small scale industry receives a purchase order to manufacture the components as shown in figure no 01. Given data-Batch size = 700 no's, material= Mild steel, raw material size ϕ200 mm X 42 mm. To finish this raw material into finish component shown in figure no.01, solve/explain the following points;	10	2, 4	4,5	3.4 .1/ 3.1 .6

	i) State pre-machining sequence of machining process (machine tool used, cutting tool used and accuracy maintained in brief)? ii) Draw the assembly view of jig plate, jig bush and work-piece component for performing final drilling operation. iii) Define *selection, design* and *manufacturing* aspects for jig plate, jig bush system and other miscellaneous elements. State probable accuracy of jig plate surfaces and jig bush surfaces to be maintained (geometric tolerance). iv) Bill of materials required for one set.  Figure no. 01				
Q4 A	Explain soldering and brazing joining processes along with their applications? Write short note on explosion welding process?	10	3	2	1.3 .1
Q4 B	Explain with neat schematic sketch working principle of External Centreless grinding machine? (5M) Answer the following question with one or two points only;	10	2 , 4	1,2	1.4 .1

	i) To have fine finish on Brass & soft bronze suitable abrasive grit material is .....? Abrasive grit material on grinding wheel should have ..... grain size? (2.5M) ii) For rough grinding operation of high speed steel material grinding wheel structure must be.....? Abrasive grits can be used are.....? (2.5M)				
Q5 A	Determine total time required for shell end milling of top face of High carbon steel block having length 1,000 mm, width 150 mm? *Helical fluted plain HSS milling cutter* of diameter 50.8 mm, flute length 76.2 mm and have 6 teeth used for plain milling of top surface. Approach distances and over run distance is equal, cutting velocity 15 meter/min and feed is 0.15 mm/tooth, depth of cut 0.8 mm. Also find horse power required for plain milling, if specific horse power required for aluminum is 0.00015 hp/mm^3/min?	10	2, 4	3,5	2.1 .2
Q5 B	Draw neat schematic diagram of automatic tool changer (ATC) unit & explain its working? Write short note on Differential indexing method?	10	2, 4	1,2	1.4 .1
Q6 A	Write short note on *Investment casting* [2M]. A part of dimensions 280X160X105 mm^3 of Grey Cast Iron material required to be manufactured using casting technique. If material is having the negative shrinkage allowance of 1.5% per side, allowable machining allowance per side is 1.5 mm. Calculate final required pattern size [4M]?	10	3	2	1.3 .1
Q6 B	A Cast steel block having length of 450 mm and with 330 mm have thickness of 100 mm. Finish size of block required to have to be of 450X330X85 mm^3. For each pass allowable depth of cut for single point tool is 3 mm. Cutting speed maintained is 300 mm/min & return stroke is 450 mm/min. For first two cuts, transverse feed is 5 mm/cutting stroke & for remaining cuts, transverse feed is 3 mm/cutting stroke. Consider approach and over run distance of tool is 5 mm each. Find how long the job will take to complete? [5M]	10	2, 4	2,3	1.4 .1
Q7 A	Sketch the following and give their specific one application: a) Box Jig b) Pot jig Explain role of jigs and fixture on machining cost with neat sketch and significance of different regions of sketch? [5M]	10	3	2,3	1.4 .1
Q7 B	Calculate total machining time to turn "SS306 steel" solid cylindrical rod of diameter 125 mm X length 350 mm into finish component as shown in figure 2? Finish component has dimensions as shown in figure 02. For, straight O.D. turning and face turning - Cutting velocity is 35 m/min, feed is 0.25 mm/rev &	10	4	2	1.3 .1

	depth of cut is 0.75 mm for both outer diameter (O.D) turning and face turning operation. For, taper O.D. turning - Cutting velocity is 20 m/min, feed is 0.20 mm/rev & depth of cut is 0.5 mm for outer diameter (O.D) turning. [Note – i) For calculating machining time of each next pass of outer diameter (O.D) turning, consider existing diameter of work piece at that instant, ii) Work holding device will require 25 mm as grip length] Figure no. 02				

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RE-EXAMINATION ODD SEMESTER

Program: **B.Tech. in Mechanical Engineering**
Class: **Second Year B.Tech.(Mechanical)**
Course code: **PCC-BTM305**
Name of the Course: **Thermodynamics**

Date:**June-2019**
Duration: **3Hr.**
Max.Points:**100**
Semester:**III**

Instructions:

- Attempt **ANY 05** questions.
- Assume suitable data wherever necessary and state the same.
- Draw **neat**and labelled system diagram **and/or** process diagram **wherver necessary.**
- **Legible hand writing,** proper figures and tidywork carry weightage.
- Use of **Steam Tables and Mollier Diagram**is permitted.
- Answers to theory questions should be brief and specific.

		Points	CO	BL	PI	Module
Q.1	**a) Prove:** For a closed system undergoing a process,Energy (E) is a state function. **Explain:**-i) Thermodynamic Equilibrium ii) Quasi-static Process. Give suitable examples.	**(10)**	1	V	1.4.1	1
	b) A piston-cylinder device contains *0.8 kg* of Helium. The gas is cooled at constant pressure till its temperature drops by *10 K*.The work of compression during the process is *16.6 kJ*.**Evaluate**:- 1) Change in Internal Energy 2) Heat Transfer. $\gamma = 1.667$ for Helium.	**(10)**	1	V	1.4.1	1
Q.2	**a) Explain:** i) PMM-1 and its converseii)Joule's Experiment.**Draw:**neat sketches	**(10)**	2	I,II	1.4.1	2
	b) A Steam Turbine receives steam at a rate of *5400 kg/hr* and developes power of *600 kW*. Neglecting the heat losses, **Evaluate**:- Change in specific enthalpy of steam flowing through the turbine if :- i) velocities and the height difference at entrance and exit of the turbine are negligible ii) if the entrance and exit velocities are *50 m/s* and *320 m/s* respectively and the inlet is *4 m* above the exit.	**(10)**	2	V	1.4.1	2
Q.3	**a) Explain**:Priniciple and working of heat pump and refrigerator with neat sketches. **Prove**:- $COP_{HP} = 1 + COP_R$;	**(10)**	2	II,V	1.4.1	3
	b) Explain :.A reversible engine working in a cycle takes in *4800 kJ* of heat per minute from a source at *800 K* and developes *20 kW* of power. The engine rejects heat to two reservoirs, one at *300 K* and the other at *360 K*.**Determine:**i) Efficiency of reversible heat engine. ii) Heat rejected in each sink in *kJ/ min*	**(10)**	2	II, V	1.4.1	3

Q.4	**a) Explain:**Kelin-Plank and Claussius Statements of II nd of Thermodynamics and **Prove:** The equivalence of both the statements.**Draw:** Neat sketches.	**(07)**	2	II,V	1.4.1	3
	b) Explain: Definition, Principle of increase for entropy and Clausius' inequality.	**(07)**	2	II,V	1.4.1	4
	c) Explain: Availability, Available Energy and Dead State.	**(06)**	2	III	1.4.1	4
Q.5	**a) Prove:-** $v = v_f + x.v_{fg}$; where the terms involved have usual meaning.Steam initially at 1.5 MPa and 300°C expands reversibly and adiabatically in a steam turbine to 40°C. **Evaluate:** i)Ideal Turbine shaft work per kg of steam. ii) Qquality of steam at turbine exit.**Draw:** Neat System and process diagrams.	**(10)**	3	I, V	1.4.1	5
	b)Explain: Effect of feeding superheated steam from boiler to turbine in a steam power plant on performance parameters of steam power plant. Steam at *20 bar, 360 ° C* from boiler is expanded in a steam turbine to *0.08 bar*in Rankine cycle plant..**Evaluate:** i) Thermal efficiency of the cycle and ii) Net work output per kg of steam assuming the turbine and pump efficiencies are *100%* ecch.**Draw:** Neat System and process diagram.	**(10)**	3	I,II, V	1.4.1	5
Q.6	**a) Derive:** Expression for thermal efficiency of i) Air Standard Otto cycle and ii) Air Standards Brayton cycle. **Draw:** Neat System and process diagrams for each.	**(10)**	3	I, V	1.4.1	6
	b)A Gas Turbine power plant working on an ideal Brayton Cycle receives air at the inlet to the compressor at 0.1 MPa and 30°C. The pressure ratio of the cycle is *6*. Maximum temperature in the cycle is 900 °C.**Evaluate**:- Efficiency of the gas turbine power plant with polytropic efficiency of compressor and turbine as *80 %.* each. Draw: Neat system and porcess diagrams.	**(10)**	3	V	1.4.1	6
Q.7	**a) Explain:**Adiabatic Flame Temperature	**(06)**	4	II	1.4.1	7
	b)Explain::Enthalpy of Formation and Enthalpy of Combustion	**(07)**	4	II	1.4.1	7
	c)Explain: Reheating of steam in thermal power plant. **Draw:**Neat system and process diagram.	**(07)**	3	II	1.4.1	5

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Re Examinations (Old Course), June 2019

Program: **B.Tech. (Mechanical Engineering)**

Course Code: PEC **BTM 708**

Course Name: **COMPUTATIONAL FLUID DYNAMICS**

Notes

- Answer any **FIVE** questions.
- Make suitable assumptions if required.
- Data shown under columns CO, BL and PI are only for academic evaluation.
  (CO: Course Outcome, BL: Blooms Taxonomy, PI: Performance Indicator)

		Points	CO	BL	PI
1.	**A.** Explain explicit and implicit approaches by using one dimensional heat conduction equation.	6	1	2	
	B. Explain Dirichlet, Neuman and Robbins boundary conditions by giving suitable examples.	7			
	C. Explain Thomas algorithm.	7	1,4		
2.	**A.** What is turbulence? Explain key characteristics of a turbulent flow.	6	1	1,2	
	B. What is turbulence modeling? Give the list of predictive methods to explain turbulence phenomenon. Explain any two of them.	7	1,2		
	C. Explain Prandtle's mixing length theory.	7	1		
3.	**A.** Show that the pressure correction equation for incompressible flow is $$\frac{\partial^2 P'}{\partial^2 x}+\frac{\partial^2 P'}{\partial^2 y}=\frac{\rho}{\Delta t}R$$ Where $P', \Delta t, \rho$ and R are pressure correction, time step, density and mass residue respectively.	10	3	2	
	B. Consider one-dimensional conduction in a plate that is part of a thermal system. The plate is of thickness 3 cm and is initially at a uniform temperature of 1000°C. At time t = 0, the temperature at the two surfaces is dropped to 0°C and maintained at this value. The thermal diffusivity of the material is $\alpha = 5 \times 10^{-6}$ m^2/s. Solve this problem by a numerical method to obtain the temperature distribution as a function of time.	10	3,4	3	
4.	**A.** What is ADI scheme? Explain the procedure for its numerical implementation. Show that this methods helps to improve the solution of a transient problem.	10	3,4	3	
	B. A cylindrical straight fin (l = 5cm, d = 1mm) of insulated tip is used for heat transfer enhancement of a body maintained at 200°C. The fin is suddenly exposed to an ambient temperature 25 °C with a convective heat transfer coefficient 50 W/m^{2}K. To study fin's transient behaviour	10	3,4	3,4	

using explicit scheme,

(i) Develop a mathematical model of the problem using integral form of energy equation

(ii) Calculate temperature at equally spaced 6 points along the fin at 4 different time step level for a good convergence.

(iii) Sketch the temperature variation at all 4 time steps mentioned above.

5.	**A.** Explain the concept of substantial derivative and derive the equation for the same.	**5**	*1,2*	*1,2*
	B. Explain the basic approach in solving a problem by numerical method.	**5**		
	C. Differentiate between Guassian elimination, Guass Seidel and TDMA methods.	**5**		
	D. List three important use of a numerical simulation of a fluid flow problems.	**5**		
6.	**A.** What is upwinding? How does it differ from central difference scheme? Explain both clearly.	**10**	*2,3*	*2,3*
	B. Discuss convergence and stability issues associated with one dimensional uncoupled convection-diffusion heat transfer under central difference interpolation of convective terms.	**10**	*2,3*	*2,3*
7.	**A.** Define and explain physical meaning of following terms in context to heat and fluid flow simulation: (i) Peclet Number (ii) Fourier Number (iii) Courrant number (iv) Nusselt Number	**10**	*1,2*	*2*
	B. Heat is conducted through a heat generating wall with its both face maintained at finite temperatures. Data: Wall thickness L = 2cm, Wall thermal conductivity k = 5 $W/m^2.K$, $T_A = T_B$=100°C, Volumetric heat generation q = 500 kW/m^3. (i) Making suitable assumptions develop governing equation and write appropriate boundary condition. (ii) Assuming minimum 5 equal divisions in a dimension, write nodal equation using FVM. (iii) Solve the discretized equations using Gauss Siedel Method	**10**	*3,4*	*3,4*