QPcode; 10083837

SE Sem IIIrd R-Mechanical R-19 cscheme

Duration: 3hrs **Marks:80**

N.B: (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.
(5) Use Steam Table.

1 Attempt any Five [20]

a) Define a thermodynamic system. Distinguish between open and closed systems with examples.

b) Define Thermal Reservoir. Difference between Heat Engine, Heat pump, Refrigerator Drive the COP of heat pump is greater than one

c) Define Joule Thomson coefficient and state its significance

d) Prove that Entropy is property of the system

e) Define a) Mach number b) Stagnation temperature c) Stagnation Pressure d) Sonic flow.

f) A gas undergoes a reversible non-flow process according to the relation $p = (-3v + 15)$ where V is the volume in m^3 and p is the pressure in bar. Determine work done when the volume changes from 3 to 6 m^3.

2 a) Write two major statements of second law of thermodynamics and explain how the concept of thermal efficiency and coefficient of performance are generated by this law. [08]

b) 2 kg of an ideal gas occupies a volume of $0.3m^3$ at 10 bar pressure and 500K temperature when this gas expands polytropically $PV^{1.2} = C$ the internal energy decreases by 300KJ. and $\gamma = 1.4$ Determine a) Specific gas constant b) Final temperature, pressure and volume c) Heat and work interaction across the system boundary. [12]

3 a) What do you mean by availability? A system at 450 K receives 225 kJ/s of heat energy from a source at 1500K, and the temperature of both the system and source remain constant during the heat transfer process. Determine net change in entropy, available energy of heat sources and system, and decrease in available energy Take atmospheric temperature equal to 300 K. [10]

b) Explain various components of a simple steam power plant with sketch. [06]

c) Define and explain the terms Available energy, Un-available energy, irreversibility and Dead state. [04]

4 a) Sketch and explain the Rankine cycle on p-v and T-s plots. [08]

b) Define a) wet steam b) Superheated steam c) Dryness fraction d) Saturation temperature. Steam initially at 0.95 dry and 12 bar expands isentropic ally in a non-flow process in a final dryness fraction of 0.8. What is the final pressure of steam and enthalpy change during the process? [12]

5 a) In a thermal power plant operating on an ideal Rankine cycle, superheated steam produced at 5MPa and 500°C is fed to a turbine where it expands to the condenser pressure of 10kPa. If the net power output of the plant is to be 20MW, evaluate: [12]

i) Heat added in the boiler in kJ/k ii) The thermal efficiency.

iii) The mass flow rate of steam in kg/sec

b) What is cut off ratio? What are assumptions of air standard cycle? [08]

For same compression ratio and heat supplied, compare Otto and Diesel cycle with the help of P-V and T-S Diagram.

6 a) An oil engine takes in air at 1.01 bar. 20°C and the maximum cycle pressure is 69 bar. The compression ratio is 18. Calculate the air standard thermal efficiency based on the dual combustion cycle. Assume that the heat added at constant volume is equal to the heat added at constant pressure. [12]

b) Explain the effect of variation in back pressure on C-D nozzle performance [08]

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 Qcode: 100087080

SE Sem III rd Mechanical R-19 (Scheme

Time: 3 Hour Max. Marks: 80

N. B.
1) Question No.1 is compulsory.
2) Attempt any three questions from the remaining five questions.
3) All questions carry equal marks.

Q1. Write notes on any FOUR [20]
(a) Hume-Rothary conditions
(b) Cooling curve of pure iron
(c) Normalizing
(d) Critical Resolved Shear Stress (C.R.S.S.)
(e) Nano composites

Q2. (a) What is plastic deformation? Explain slip mechanism with a neat sketch. [10]
(b) Define fatigue failure. Discuss fatigue testing. Explain interpretation of S-N curve for ferrous and non –ferrous metals. [10]

Q3. (a) Classify various types of crystal defects? Discuss any one defect in details. [10]
(b) Draw the iron -iron carbide equilibrium diagram and write the important transformation seen in the diagram. [10]

Q4. (a) What is flame hardening process? Discuss advantages, disadvantages and applications of it. [8]
(b) Discuss the properties of polymer materials. [4]
(c) Derive an expression for Griffith's theory of brittle materials failure. [8]

Q5. (a) Draw and explain pack carburizing process. Discuss its applications. [8]
(b) Explain the processing of ceramics materials through injection moulding operation. [7]
(c) Define Shape Memory Alloys (SPA). Discuss their properties and applications. [5]

Q6. (a) Draw and explain Isomorphous and Eutectoid phase diagram. [6]
(b) Discuss working principle of ultrasonic testing machine with neat sketch. [8]
(c) Define nanotechnology? Discuss its applications in various fields. [6]

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QP – 10082314

SE | Sem III | R-19 C-scheme | Mechanical

Time: 3 hours | Max. Marks: 80

Note-
1. Question one is compulsory.
2. Solve any three out of remaining five.

Q.1		**Write Short notes with sketch wherever applicable. (Solve any Four)**	**20**
	a	Pattern Allowances	
	b	Friction welding	
	c	Rolling defects	
	d	Gear shaping	
	e	Industrial revolutions	
Q.2	a	Explain the desirables properties of molding sands, also explain different types molding sands used in the foundry	10
	b	Classify welding and compare soldering and brazing	10
Q.3	a	Describe different types of dies with neat sketches	10
	b	Write short not on column and knee type milling machine	10
Q.4	a	What are various methods of taper turning on lathe machine, explain any one type in detail with neat sketch	10
	b	Explain stepwise procedure of powder metallurgy.	10
Q.5	a	Describe the investment casting process with neat sketches.	10
	b	Write short note on thermit welding with their advantages, disadvantages applications.	10
Q.6	a	Compare the following 1. Shaper and planer 2. Hot chamber and cold chamber die casting	10
	b	List various nontraditional machining methods and explain electro-chemical machining in detail	10

QP code : 10083689

SE sem-III Mechanical R-19 C scheme

(3 Hours) **Total Marks: 80**

Note: 1) Question No.1 is **compulsory.**
2) Attempt **any THREE** from the remaining.
3) Figures to the right indicate full marks.

Q.1 A) Find the values of constants a,b,c and d if $f(z) = (x^2 + 2axy + by^2) + i(cx^2 + 2dxy + y^2)$ is analytic — 5

B) Find the Eigen Value of $A^3 - 3A^2$ — 5

Where $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$

C) Find the Laplace Transform of t sin at — 5

D) Find the Fourier series expansion for f(x) = x defined in (-1,1) — 5

Q.2 A) If $L[f(t)] = \frac{s}{s^2+s+4}$ find $L[e^{-3t}f(2t)]$ — 6

B) Find the Fourier series expansion for f(x) = x defined in $(-\pi, \pi)$ with period 2π — 6

C) Find the analytic function f(z) with the real part $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ — 8

Q.3 A) Show that the function $u = x^3 - 3xy^2$ is harmonic function. Hence find the corresponding analytic function and harmonic conjugate. — 6

B) A string is stretched and fastened to two points distance L apart motion is started by displacing the string in the form $u = \alpha \sin(\frac{\pi x}{L})$ from which it is released at time t = 0. Show that the displacement of a point at a distance X from one end at time t is given by $u(x,t) = \alpha \sin\left(\frac{\pi x}{L}\right)\cos(\frac{\pi ct}{L})$ — 6

C) Obtain the Fourier series expansion of $f(x) = |x|$ where $-\pi \le x \le \pi$ — 8

Q.4 A) Find Laplace transform of $e^{-4t}\int_0^t usin3u\,du$ — 6

B) Find Inverse Laplace transform of $\frac{2s+3}{s^2+2s+2}$ — 6

C) Verify Cayley – Hamilton theorem for the matrix A and hence find A^{-1} & A^4 — 8

where $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$

Q.5 A) Solve by Crank-Nicholson simplified formula $\frac{\partial^2 u}{\partial x^2} - 16\frac{\partial u}{\partial t} = 0$,$0 \le x \le 1$ subject to the condition u(0,t) = 0,u(1,t) = 100t , u(x,0) = 0, $h = \frac{1}{4}$ for one –time step. — 6

B) Find the inverse Laplace transform of $\log\left(\frac{s+a}{s+b}\right)$ — 6

C) Show that the matrix $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 7 \end{bmatrix}$ is diagonalizable. Find transforming matrix and diagonal Matrix. — 8

Q.6 A) Evaluate $\int_0^\infty e^{-3t}\, t\, sint\, dt$ using Laplace transform. — 6

B) Find the solution $u_t = u_{xx}$ subject to u(0,t) = 0,u (5,t) = 0,u (x,0) = $x^2(25 - x^2)$ using Schmidt method taking h = 1 up to 3 seconds. — 6

C) Find the inverse Laplace transform of $\frac{s}{(s^2+1)^2}$ using convolution theorem. — 8

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