

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)
Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad

II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, NOVEMBER-2019Subject: **PROBABILITY & STATISTICS**

Branch: ME,CSE,MINING

Time: 3 hours

Max. Marks: 75

PART – A**I. Answer ALL questions of the following****5x1M=5 M**

1. Define Variance of continuous probability distribution.
2. Write rank correlation formula for repeated ranks.
3. What is meant by Standard Error?
4. If arrival rate is 3 per hour service rate is 5 per hour then find traffic intensity.
5. Give an example for a stochastic matrix?

II. Answer ALL questions of the following**10x2M=20 M**

1. If X and Y are two discrete random variables, then prove that $E(X+Y) = E(X) + E(Y)$ provided $E(X)$ $E(Y)$ exist.
2. Derive the mean of Normal distribution.
3. Write regression lines for three variables.
4. Define the statistical independence of two jointly distributed random variables.
5. Define unbiased estimator.
6. Define null hypothesis and alternative hypothesis.
7. Write the relations between L_q , L_s , W_q , and W_s in $(M/M/1) : (\infty/\text{FIFO})$ model.
8. Arrival rate is $1/8$ per minute, service rate is $1/4$ per minute. Find L_q .
9. Write any two classifications of Markov chain.
10. Write the Markovian algorithm

PART-B**Answer ALL questions of the following****5x10 M= 50M**

1. A continuous random variable X has a probability density function $f(x)=Kx^2e^{-x}$, $x \geq 0$. Find K, mean and variance.

OR

2. When the mean of marks was 50% and standard deviation 5% then 60% of the students failed in an examination. Determine the grace marks to be awarded in order to show that 70% of the students passed. Assume that the marks are normally distributed.

3. Find the correlation coefficient between x and y from the given data:

x	78	89	97	69	59	79	68	57
y	125	137	156	112	107	138	123	108

OR

4. Calculate Karl Pearson's correlation co-efficient for the following data.

x	38	45	46	38	35	38	46	32	36	38
y	28	34	38	34	36	26	28	29	25	36

5. Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins, show the Sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distribution is normal, test hypothesis that the true variances are equal.

OR

6. A sample of 100 electric bulbs produced by manufacturer A showed a mean life time of 1190 hours and a standard deviation of 90 hours. A sample of 75 bulbs produced by manufacturer B showed a mean life time of 1230 hours with a standard deviation 120 hours. Is there a significant difference between the mean life time of two brands at a significance level of (i) 0.05 (ii) 0.01.

7. Barber A takes 15 minutes to complete a haircut. Customers arrive in his shop at an average rate of one every 30 minutes. Barber B takes 25 minutes to complete one haircut and customers arrive at his shop at an average rate of one every 50 minutes. The arrival processes are Poisson and the service times follow an exponential distribution. a) Where would you expect a bigger queue. b) Where would you require more time waiting included to complete a haircut?

OR

8. A one person barber shop has six chairs to accommodate people waiting for haircut. Assume that customers who arrive when all the six chairs are full leave without entering the shop. Customers arrive at the average rate of 3 per hour and spend an average of 15 minutes for service. Find
a) The probability that a customer can get directly in to the barber chair upon arrival.
b) Expected number of customers waiting for a haircut.
c) Effective arrival rate.

9. a) Write classification of stochastic process.
b) Define irreducible and ergodic matrix.

OR

10. a) Define the types of stochastic process with an example

b) The transition probability matrix of a Markov chain is given by $\begin{bmatrix} 0.3 & 0.7 & 0 \\ 0.1 & 0.4 & 0.5 \\ 0 & 0.2 & 0.8 \end{bmatrix}$ is this matrix irreducible?

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1. What is the mean piston speed of two stroke engine, if L is the stroke and N is the rpm?
2. Explain the term "Availability".
3. What will be the entropy change for an ideal gas in a rigid tank if the temperature remains constant due to heat transfer?
4. Draw a P-V and T-S diagram of ERICCSION cycle.
5. Define dry bulb temperature.

II. Answer ALL questions of the following**10x2M=20 M**

1. A 600 MW steam power plant, which is cooled by a nearby river, has a thermal efficiency of 40%. Determine the rate of heat transfer to the river water.
2. What is meant by Mechanical equilibrium?
3. The rate of heat transfer to a heat engine is 49 KJ/s and its net power output is 9.4 KW. Determine thermal efficiency.
4. Explain about potential and kinetic energy.
5. An ideal gas goes through a reversible heat addition process at constant temperature. On T-s diagram plot the heat addition process.
6. Write short notes on internal energy.
7. Provide any two advantages of two stroke engine over four stroke engine.
8. Write thermal efficiency formula of an ideal cycle for SI engine.
9. Represent the following process using Skelton Psychometric chart i) Cooling and dehumidification. ii) Evaporative cooling .
10. Define relative humidity and write down its formula.

PART-B**Answer ALL questions of the following****5x10 M= 50M**

1. a) Define entropy and irreversibility. **4M**
b) A 50kg copper block initially at 80°C is dropped into an insulated tank that contains 120litre of water at 25°C. Determine, (i) the final equilibrium temperature, and (ii) the total entropy change for this process **6M**

OR

2. a) Explain about point and path function
b) A Fluid system undergoes a non flow frictionless process from $v_1 = 0.13$ to $v_2 = 0.05 \text{ m}^3$ following the relation $P = (4.2 / v + 2.1)$ bar where v is in m^3 . During the process the system rejects 12.5 kJ of heat. Find the work done and change in internal energy.

3. a) Explain about equivalence of Kelvin planck and clauses statements.
 b) A Steel billet of 2000kg mass is to be cooled from 1250 K to 450 K. The heat released during the process is to be used as a source of energy. The ambient temperature is 303K and specific heat of steel is 0.5KJ/kg K. Determine the available energy of this billet.

OR

4. a) What is the second law of Thermodynamics.
 b) A 30 kg stone falls from a height of 1000 m in a vacuum and strikes a 100 kg steel plate. For isolated adiabatic system of stone and plate, compute ΔS . Assume that the specific heats of both stone and plate are 0.84 kJ/kg K and both experience the same temperature rise of 15°C.
5. Calculate the specific volume of saturated steam at 200°C, if the 1 m³ closed vessel contains 1:9 volumetric ratio of liquid and vapor. (i) Determine the mass of vapor and liquid (ii) Find quality (iii) Compute the % vapor present by volume and also by mass, what is the difference?

OR

6. a) Define dryness fraction. 3M
 b) Explain about Charles law and characteristic equations. 7M
7. a) By making use of P-V (pressure-volume) and T-S(temperature-entropy) diagrams distinguish Atkinson and Otto cycles. 4M
 b) Determine the efficiency of an ideal Atkinson cycle for a compression ratio of 6 & with a maximum pressure of 2×10^6 Pa. The condition of air before isentropic compression can be taken as 10^5 Pa & 27°C. 6M

OR

8. a) Explain Otto cycle with neat diagram?
 b) In an Otto cycle, the pressure limits of 100 kN/m² and 2000 kN/m². The compression ratio is 4. Calculate, (i) The thermal efficiency (ii) Mean effective Pressure.
9. The air inside a room is to be maintained at 25°C DBT and 50% RH. Before entering the cooling coil the re-circulated air is mixed with fresh air in the ratio of 3:1, the ambient air condition is 40°C DBT and 60% RH, the effective ADP and the overall bypass factor of cooling coil are 10°C and 0.1 respectively. The quantity of air supplied to the room is 100m³/min and the specific heat of humid air and latent heat of water are 1.0216 kJ/kg of dry air and 2500 kJ/kg of water vapor.
 a) Draw (i) the line diagram for the process; (ii) the process on the psychrometric chart. 4M
 b) Determine the total heat gain rate from the room. 6M

OR

10. a) Explain Psychrometric properties of air.
 b) The atmospheric air at 30°C DBT and 40% R.H. is cooled to 15°C DBT. Calculate the heat removed if the supply of air is 150 m³/min.

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, NOVEMBER-2019

Subject: **METALLURGY AND MATERIAL SCIENCE**

Branch: ME

Time: 3 hours

Max. Marks: 75

PART – A

I. Answer ALL questions of the following

5x1Mark=5 Marks

1. What is the difference between ordered solid solution and disordered solid solution?
2. Write eutectoid reaction general equation.
3. What material is best for damping?
4. What is mean by tempering?
5. Define cermet.

II. Answer ALL questions of the following

10x2Marks=20 Marks

1. Explain Atomic Packing Factor with an example.
2. Define interstitial solid solution
3. What is coring? Under what conditions cored structure is obtained.
4. Draw and Label Eutectic System.
5. List the classification of steels.
6. State the merits and demerits of gray cast iron and ductile cast iron.
7. What are the applications of aluminum alloys?
8. Effect of alloying elements of iron carbide diagram.
9. Define the term ceramics. Give examples for different traditional ceramics.
10. Explain types of metal matrix composites.

PART-B

Answer ALL questions of the following

5x10 Marks= 50Marks

1. Explain the role of grains and grain boundaries on material properties.

OR

2. What are the different types of bonding systems in solids?

3. From the given data below for Cd-Bi system, plot the equilibrium diagram to scale and find

(i) Amount of eutectic in 20%Cd

(ii) Free cadmiu in 70%Cd alloy

Given Melting point temperature of Bi=271°C, Melting point temperature of Cd=321°C,

Eutectic temperature=144°C,

Eutectic composition = 397%

OR

4. Draw the Fe-Fe₃C phase diagram. And explain briefly.

5. Give the composition, properties and uses of

i) White cast iron

ii) Nodular iron

iii) Malleable cast iron

OR

6. Give typical composition and uses of the various types of steels.

7. Briefly explain the effect of alloying elements on properties of steel.

OR

8. Explain the structure and properties of copper and its alloys.

9. Briefly describe the properties and applications of ceramic materials.

OR

10. What is meant by composite give the advantages and applications of composites?

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Time: 3 hours

Max. Marks: 75

PART – A**I. Answer ALL questions of the following****5x1M=5 M**

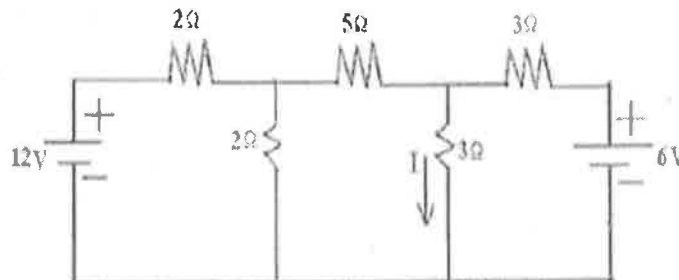
1. State Reciprocity Theorem.
2. Define magnetic coupling coefficient
3. Define slip of an induction machine.
4. Define cut-in voltage for a diode.
5. Define deflection.

II. Answer ALL questions of the following**10x2M=20 M**

1. Two $1.2\text{ k}\Omega$ resistors are in series and this series combination is in parallel with a $3.3\text{ k}\Omega$ resistor. Find the total resistance?
2. Define potential and potential difference.
3. The primary coil of a transformer is connected to a 60 V ac source. The secondary coil is connected to a 330Ω load. The turns ratio is $3:1$. What is the secondary voltage?
4. Define various types of losses in a transformer
5. What are different types of d.c motors?
6. A 250 V shunt motor takes a total current of 20 A . The shunt field and armature resistances are 200Ω and 0.3Ω respectively. Determine the shunt field current
7. Differentiate between power amplifier and voltage amplifier?
8. Write the Diode Applications
9. How do you obtain feedback in Colpitts oscillator?
10. How to measure frequency using CRO?

PART-B**Answer ALL questions of the following****5x10 M= 50M**

1. Find the current **I** in the circuit shown below



2. a) Explain the Faraday's laws of electromagnetic induction and its applications.
b) Three resistors $R\Omega$, $2R\Omega$, $3R\Omega$ are connected in delta. Calculate the resistances for an equivalent star connection.

3. Define i) MMF ii) Magnetic flux iii) Magnetic flux density iv) Magnetic field strength v) Permeability.
4. a) Explain SC tests on transformer in detail.
b) In a no-load test of a single phase transformer, the following test data were obtained. Primary voltage: 220 V, Secondary voltage: 110V, Primary current: 0.5A Power input: 30W. Find (i) the magnetizing component of no load current (ii) the iron loss component of no load current. The resistance of primary winding is 0.6Ω .
5. Derive the equations for starting Torque and Torque under running conditions for an induction motor
6. A 250V shunt motor takes a total current of 20A. The shunt field and armature resistances are 200Ω and 0.3Ω respectively. Determine a) Value of back emf b) Gross mechanical power in the armature.
7. What is a Zener diode? Explain the characteristics and applications of Zener diode.
8. a) Explain the SCR operation and its applications.
b) Explain the operation of NPN transistor with neat diagram
9. Derive and explain magnetic deflection of CRT.
10. With a neat diagram explain working of CRO. Explain how to measure frequency, voltage and current.