AR20

CODE: 20MET205 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech.II Semester Regular/Supplementary Examinations, Aug ,2023

APPLIED THERMO FLUIDS-II

(MECHANICAL ENGINEERING)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

			Marks	CO	Blooms Level
		UNIT-I			
1.		Explain the modified ranking cycle with T-S Diagram.	10	1	Analyzing
		(OR)			
2.		Steam at a pressure of 15 bar and 250^{o}C is expanded through a turbine at first to a pressure of 4 bar. It is then reheated at constant pressure to the initial temperature of 250^{o}C and is finally expanded to 0.1 bar. Estimate the work done per kg of steam flowing through the turbine and amount of heat supplied during the process of reheat. Compare the work output when the expansion is direct from 15 bar to 0. 1 bar without any reheat. Assume all expansion processes to be isentropic.	10	1	Applying
		UNIT-II	Marks	CO	Blooms Level
3.		State the differences between fire tube and water tube boilers	10	2	Analyzing
		(OR)			
4.		State the merits of Benson boiler and explain its working in detail.	10	2	Understanding
		UNIT-III	Marks	CO	Blooms Level
5.	a	Classify steam nozzles and discuss their applications.	5	3	Understanding
	b	Steam is expanded in a set of nozzles from 10 bar and 200^{o}C to 5 bar. What type of nozzle is it? Neglecting the initial velocity find minimum area of the nozzle required to allow a flow of 3kg/s under the given conditions. Assume that expansion of steam to be isentropic.	5	3	Applying
		(OR)			
6.		Explain The working of surface condenser with neat sketch also state its advantages and disadvantages.	10	3	Applying
		UNIT-IV	Marks	CO	Blooms Level
7.		What do you understand by the term compounding? Explain pressure velocity compounding in detail.	10	4	Understanding
		(OR)			

8.	A 50% reaction turbine (with symmetrical velocity triangles) running at 400r.p.m. has the exit angle of the blades as 20^o and the velocity of steam relative to the blades at the exit is 1.35 times the mean blade speed. The steam flow rate is 8.33kg/s and at a particular stage the specific volume is $1.381m^3/kg$. Calculate for this stage; (a) A suitable blade height, assuming the rotor mean diameter 12 times the blade height, and (b) The diagram work	10	4	Applying
	UNIT-V	Marks	CO	Blooms Level
9.	Explain the methods for improving thermal efficiency of open cycle gas turbine plant.	10	5	Understanding
	(OR)			
10.	In a gas turbine the compressor is driven by the high pressure turbine. The exhaust from the high pressure turbine goes to a free low pressure turbine which runs the load. The air flow rate is 20kg/s and the minimum and maximum temperatures are respectively 300K and 1000K. The compressor pressure ratio is 4. Calculate the pressure ratio of the low pressure turbine and the temperature of exhaust gases from the unit. The compressor and turbine are isentropic. Cp of air and exhaust gases = 1 kJ/kg K and γ = 1.4.	10	5	Applying
	UNIT-VI	Marks	CO	Blooms Level
11.	With the help of psychrometric chart, explain the following processes: a) Sensible heating b) Sensible cooling c) Humidification d) Dehumidification.	10	6	Understanding
	(OR)			
12.	An air-conditioned hall is to be maintained at 27^0C DBT and 21^0C WBT. It has a sensible heat load of 46.5 kW and a latent heat load of 17.5 kW. The air supplied from the outside atmosphere at 380C DBT and 27^0C WBT is $25m^3$/min, directly into the room through ventilation and infiltration. Outside air to be conditioned is passed through the cooling coil whose ADP is 15^0C. The quantity of recirculated air from the hall is 60%. This quantity is mixed with the conditioned air after the cooling coil. Determine (i) the condition of the air after the coil and before the recirculated air mixes with it. (ii) the condition of air entering the hall i.e., after mixing with recirculated air (iii) mass of fresh air entering the cooler (iv) BPF of the cooling coil (v) refrigerating load on the cooling coil	10	6	Applying

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CODE: 20EST206 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech.II Semester Supplementary Examinations, Aug 2023

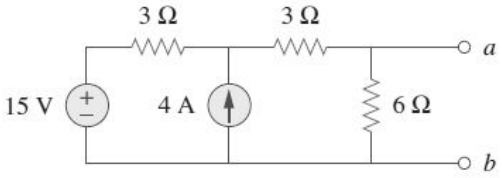
NETWORK ANALYSIS

(ELECTRONICS AND COMMUNIATION ENGINEERING)

Time: 3 Hours **Max Marks: 60**

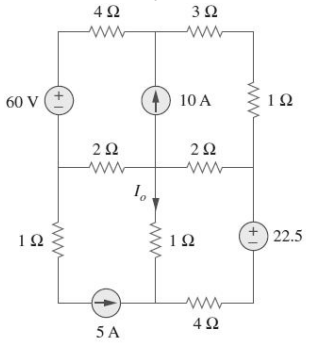
Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

			Marks	CO	Blooms Level
		UNIT-I			
1.	a	State and explain Norton's Theorem.	5	1	2
	b	Find the Norton equivalent circuit for the circuit shown in the figure at terminals *a-b*.	5	1	3

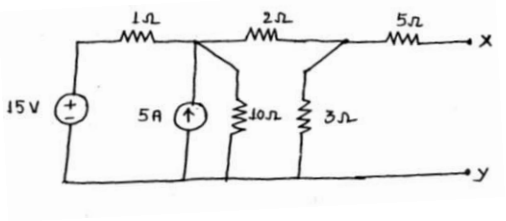


(OR)

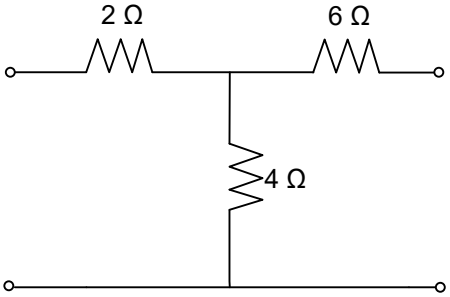
2.	a	Use mesh analysis to determine I_o in the following circuit.	5	1	3



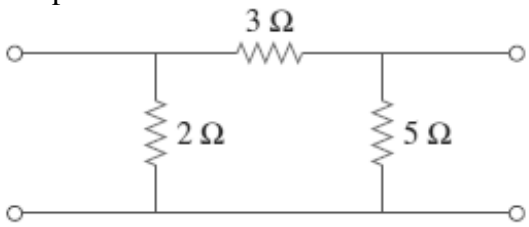
	b	State and explain Thevenin's Theorem.	5	1	2
		UNIT-II	Marks	CO	Blooms Level
3.	a	State and explain Compensation Thereom.	5	2	2
	b	State and explain Millman's Theorem.	5	2	3
		(OR)			
4.	a	State and Explain Substitution Theorem.	5	2	2
	b	What resistance should be connected across *x-y* in the circuit shown in the figure such that maximum power is developed across this load resistance.	5	2	3



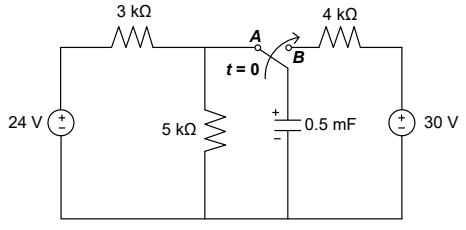
			Marks	CO	Blooms Level
		UNIT-III			
5.	a	Obtain the Y-parameters for the *T* network shown below.	5	3	3



	b	The Z parameters of a two-port network are Z_{11} = 10 Ω, Z_{22} = 15 Ω, Z_{12} = 5 Ω, Z_{21} = 5 Ω. Find the equivalent ABCD parameters.	5	3	2
		(OR)			
6.	a.	Determine the *Y* parameters for the circuit shown below	5	3	3

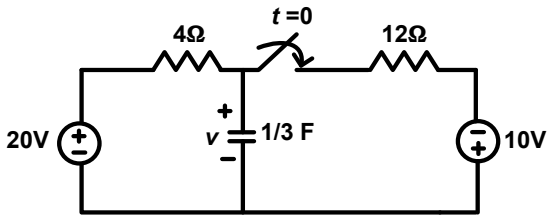


	b	Express the ABCD parameters of a Two port network in terms of Y parameters.	5	3	2
		UNIT-IV	Marks	CO	Blooms Level
7.		Define resonance in an electrical circuit. Derive the expression for the resonant frequency, bandwidth and quality factor in a series *R-L-C* circuit.	10	4	2
		(OR)			
8.	a	Differentiate Series and parallel Resonance.	5	4	2
	b	What is a Locus Diagram. Draw the locus diagram for an RL series circuit.	5	4	3
		UNIT-V	Marks	CO	Blooms Level
9.		Derive a low pass prototype filter.	10	5	2
		(OR)			
10.		Design a constant *K*- low pass filter having cut-off frequency 2.5 kHz and design resistance R_o = 700 Ω. Also find the frequency at which this filter produces attenuation of 19.1dB. Find its characteristic impedance and phase constant at pass band and stop or attenuation band.	10	5	3
		UNIT-VI	Marks	CO	Blooms Level
11.		The switch has been in position *A* for a long time. At t = 0, the switch moves to *B*. Determine $v(t)$ for $t>0$ and calculate its value at t = 1 sec and 4 sec.	10	6	3



(OR)

12.	Find $v(t)$ for $t>0$ in the circuit shown. Assume the switch has been open for a long time and is closed at $t = 0$. Calculate $v(t)$ at $t = 0.5$ sec.	10	6	3



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CODE: 20EST203 SET-2

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech. II Semester Regular/Supplementary Examinations, May,2023

ENGINEERING MECHANICS

(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

		Marks	CO	Blooms Level
	UNIT-I			
1.	Determine the resultant and direction of the force system as shown in Fig.1.	10	1	3

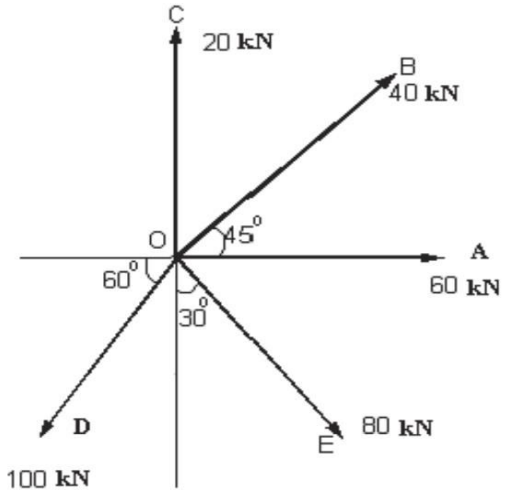


Fig.1.

(OR)

2.	The resultant of two forces, one of which is double the other is 260 N. If the direction of the larger force is reversed and the other remains unaltered, the magnitude of the resultant reduces to 180 N. Determine the magnitude of the forces and the angle between the forces.	10	1	3
	UNIT-II			
3.	A system of parallel forces acting on a rigid bar as shown in Fig.2. reduce this system to i). A single force ii). A single force and a couple at A iii). A single force and a couple at B	10	2	3

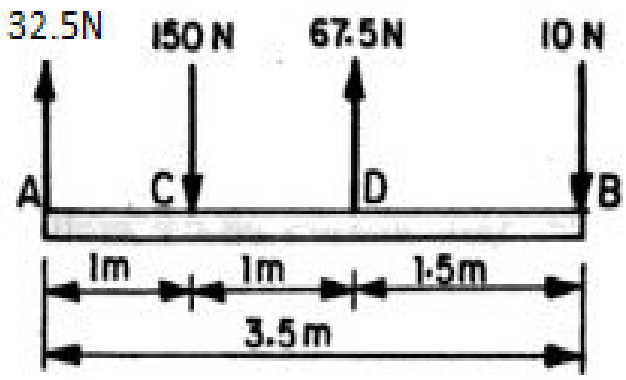


Fig.2.

(OR)

4.	(a)	State and prove the Varignon's theorem.	6	2	2
	(b)	Explain with a neat sketch how to convert a force into a single force and couple.	4	2	2

UNIT-III

5. A Warren girder (Fig.3) consisting of seven members each of 3 m length freely supported at its end points.The girder is loaded at B and C as shown. Find the forces in all the members of the girder indicating whether the force is compressive or tensile. 10 3 3

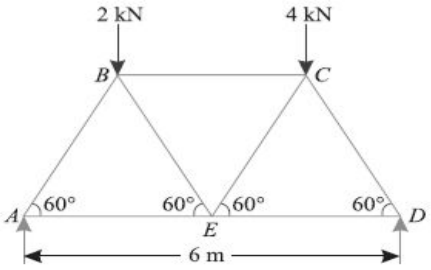


Fig.3.

(OR)

6. Two blocks A and B weighing 3 kN and 15 kN, respectively, are held in position against an inclined plane by applying a horizontal force P as shown in Fig.4. Find the least value of P which will induce motion of the block A upwards. Angle of friction for all contact surfaces is 12^0. 10 3 3

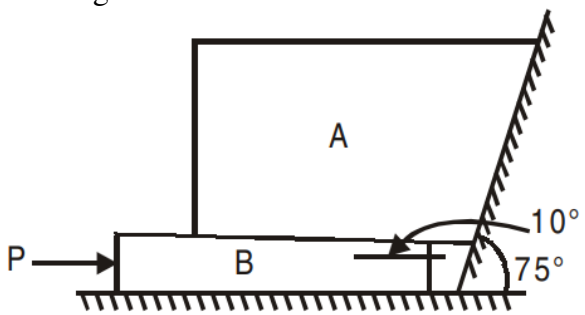


Fig.4.

UNIT-IV

7.	(a)	State Pappus-Guldinus theorem.	3	4	2
	(b)	State and prove Parallel axis theorem of moment of inertia.	7	4	2

(OR)

8. Determine the centroid of the built-up section with respect to x and y axes shown in Fig. 5. All dimensions are in mm. 10 4 3

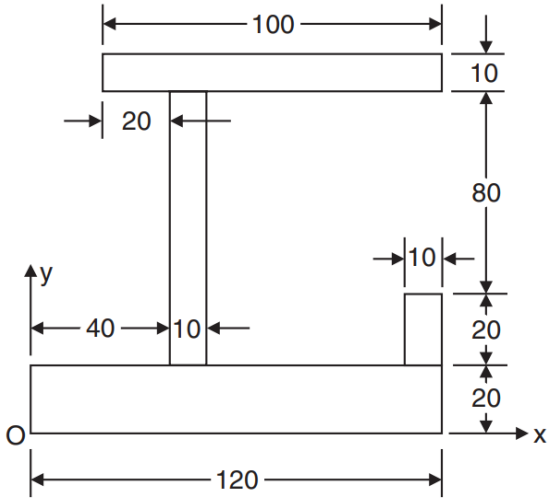
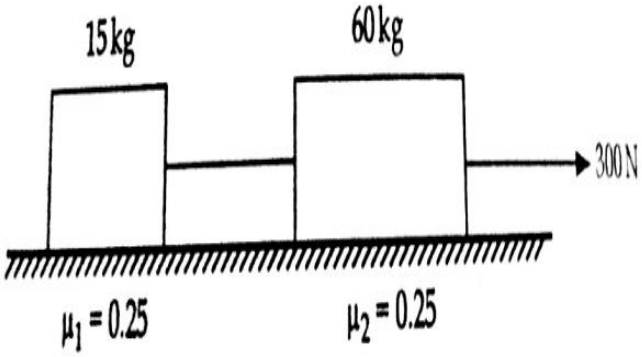


Fig. 5.

UNIT-V

9.	(a)	A train is uniformly accelerated and passes successive km stones with velocities of 18 km/hr and 36 km/hr respectively. Calculate the velocity when it passes the third km stone. Also find the time taken for each of the two intervals of one km.	5	5	3
	(b)	The motion of a particle in rectilinear motion is defined by the relation $s = 2t^3 - 9t^2 + 12t - 10$ where s is expressed in metres and t in seconds. Find i). The acceleration of the particle when the velocity is zero ii). The position and the total distance travelled when the acceleration is zero.	5	5	3

(OR)

10.		To blocks of mass 60 kg and 15 kg are connected by a string and move along a rough horizontal surface when force of 300 N is applied to the block of 60 kg msass as shown Figure Aplly D'Alembert's priciple to determine the acceleration of the blocks and tension in the string. Assume tht coefficient of friction between the sliding surface of the blocks and the plane is 0.25.  	10	5	3

UNIT-VI

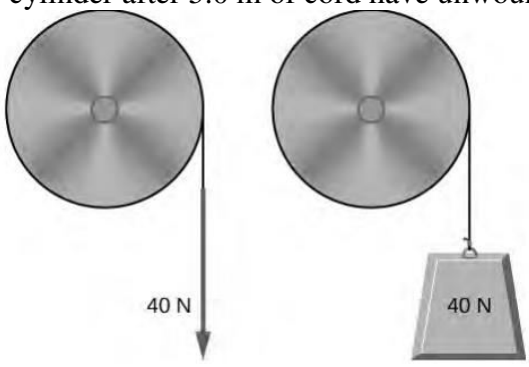
11.		A cord is wrapped around the rim of a solid cylinder of radius 0.25 m, and a constant force of 40 N is exerted on the cord shown, as shown in the following Fig.7. The cylinder is mounted on frictionless bearings, and its moment of inertia is 6.0 kg · m^2. (a) Use the work energy theorem to calculate the angular velocity of the cylinder after 5.0 m of cord have been removed. (b) If the 40-N force is replaced by a 40-N weight, what is the angular velocity of the cylinder after 5.0 m of cord have unwound?  	10	6	3

Fig.7.

(OR)

12.	(a)	What is the energy of motion for a rigid body rotating about a fixed axis?	4	6	3
	(b)	A 70kg sprinter starts from rest and accelerate uniformly for 5.8s over a distance of 34.5m. Neglecting air resistance, determine the average power developed by the sprinter.	6	6	3

AR20

CODE: 20BST204 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech.II Semester Supplementary Examinations, Aug, 2023

Probability & Statistics with R

(COMMON TO CSE, CSE (AIML) & IT Branches)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

			Marks	CO	Blooms Level
		UNIT-I			
1.		A random variable X has the following probability distribution	10	CO1	K1

x	-2	-1	0	1	2	3
p(x)	0.1	K	0.2	2k	0.3	k

Find the value of k and calculate mean and variance

(OR)

2.	a.	It has been claimed that in 60% of all solar heat installations the utility bills is reduced by at least one-third. Accordingly, what are the probabilities that the utility bill will be reduced by at least one-third in (i) four of five installations (ii) at least four of five installations.	5	CO1	K1
	b.	If the probability that an individual suffers a bad reaction from a certain injection is 0.001, determine the probability that out of 2000 individuals (i) exactly 3 (ii) more than 2 individuals (iii) none suffer a bad reaction.	5	CO1	K1
		UNIT-II			
3.		If a random variable has the probability density f(x) as $f(x) = \begin{cases} 2e^{-2x}, for\ x > 0 \\ 0, for\ x \leq 0 \end{cases}$ find the P(1≤X≤3), P(X>0.5)	10	CO2	K3
		(OR)			
4.	a.	For a normally distributed variate with mean 1 and standard deviation 3, estimate the probabilities that (i) $3.43 \leq x \leq 6.19$ (ii)$-1.43 \leq x \leq 6.19$.	5	CO2	K5
	b.	Suppose 10 percent of the probability for a normal distribution $N(\mu, \sigma^2)$ is below 35 and 5 percent above 90. What are the values of μ and σ?	5	CO2	K3
		UNIT-III			
5.		A population consists of four numbers5,10,14,18,13 and 24 Consider all possible distinct samplesof size two without replacement. Determine (i) the populationmean (ii) the population standard deviation (s.d.)(iii) the sampling distribution of means (iv) the meanof the S.D. of means (v) s.d. of S.D. of means. Verify(iii) and (v) directly from (i) and (ii) by use of suitable formulae.	10	CO3	K5
		(OR)			

6.	a.	The mean and the standard deviation of a population are 11,795 and 14054 respectively. If n=50, asses 95% confidence interval for the mean.	5	CO3	K5
	b.	Among 100 fish caught in a large lake, 18 were inedible due to the pollution of the environment. With what confidence can we assert that the error of this estimate is at most 0.065?	5	CO3	K5

UNIT-IV

7.	a.	Explain about (i) Null hypothesis (ii) Alternate hypothesis.	4	CO4	K2
	b.	A manufacturer claimed that atleast 95% of the equipment which he supplied to a factory confirmed to specifications. An examination of a sample of 200 pieces of equipment revealed that 18 were faulty. Test this claim at 5% level of significance.	6	CO4	K4

(OR)

8.	a.	Explain the working rule for testing of Hypothesis.	4	CO4	K2
	b.	A machine runs on an average of 125hours/year. A random sampleof 49 machines has anannual average use of 126.9 hours with standard deviation8.4 hours. Does this suggest to believe that machinesare used on the average more than 125 hoursannually at 0.05 level of significance?	6	CO4	K4

UNIT-V

9.	a.	In a random sample of 10 bolts produced bya machine the mean length of bolt is 0.53 mmand standard deviation 0.03 mm. Can we claimfrom this that the machine is in proper workingorder if in the past it produced bolts of length0.50 mm? Use 0.01 L.O.S.	5	CO5	K3
	b.	The household net expenditure onhealth care in south and north India, in two samplesof households, expressed as percentage of total income is shown the following table	5	CO5	K4

South	15.0	8.0	3.8	6.4	27.4	19	35.3	13.6	
North	18.8	23.1	10.3	8.0	18.0	10.2	15.2	19.0	20.2

Test the equality of variances of households netexpenditure on health care in south and north India.

(OR)

10.		Test for goodness of fit of a Poissondistribution at 0.05 L.O.S. to the following frequencydistribution:	10	CO5	K4

Number of patients arriving/hour: (x)	0	1	2	3	4	5	6	7	8
Frequency	52	151	130	102	45	12	5	1	2

UNIT-VI

11.		Estimate (predict) the blood pressure(B.P.) of a woman of age 45 years from thefollowing data which shows the ages *X* and systolicB.P. *Y* of 12 women. Are the two variables' ages*X* and B.P. *Y* correlated?	10	CO6	K5

Age (X)	56	42	72	36	63	47	55	49	38	42	68	60
B.P. (Y)	147	125	160	118	149	128	150	145	115	140	152	155

(OR)

12.		Evaluate a suitable coefficient of correlation for the following data:	10	CO6	K5

Fertiliser used (tonnes)	15	18	20	24	30	35	40	50
Productivity (tonnes):	85	93	95	105	120	130	150	160

AR20

CODE: 20BST203 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech. II Semester Supplementary Examinations, Aug, 2023
COMPLEX VARIABLES AND STATISTICAL METHODS
(CIVIL Engineering.)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

		Marks	CO	Blooms Level
	UNIT-I			
1.	Show that $f(z) = \begin{cases} \frac{x\,y^2(x+iy)}{x^2+y^4}, z \neq 0 \\ 0, \quad z = 0 \end{cases}$ is not analytic at $z = 0$ although C-R equations are satisfies at the origin.	10	CO1	K3
	(OR)			
2.	Find the analytic function whose real part is $log\sqrt{x^2+y^2}$, using Milne – Thompson method .	10	CO1	K3
	UNIT-II			
3.	Verify Cauchy's theorem for the function $3Sin3z$ if C is the square with vertices at $1 \pm i$ and $-1 \pm i$.	10	CO2	K4
	(OR)			
4.	Evaluate $f(2)$ and $f(3)$ where $f(a) = \int_C \frac{2z^2-z-2}{z-a} dz$ and C is the circle $\|z\| = 2.5$ described in positive sense.	10	CO2	K4
	UNIT-III			
5.	Calculatethe residue of $\frac{z^2}{z^4+1}$ at those poles which lie inside the circle $\|z\| = 2$.	10	CO3	K3
	(OR)			
6.	Show that $\int_0^{2\pi} \frac{d\theta}{\frac{5}{4}+sin\theta} = \frac{8\pi}{3}$.	10	CO3	K3
	UNIT-IV			
7.	Out of 800 families with 4 children each, how many families would be expected to have (i) 2 boys and 2 girls (ii) at least one boy (iii) no girl (iv) at most two girls? Assume equal probabilities for boys and girls.	10	CO4	K2
	(OR)			
8.	Suppose the weights of 800 male students are normally distributed with mean $\mu = 140$ pounds and standard deviation 10 pounds. Estimate the number of students whose weights are (i) between 138 and 148 pounds (ii) more than 152 pounds.	10	CO4	K2
	UNIT-V			
9.	Construct S.D. of means for the population 3,7, 11, 15 by drawing samples of size two without replacement. Determine (a) μ (b) σ (c) *S.D.M.* (d) $\mu_{\bar{X}}$(e)$\sigma_{\bar{X}}$.	10	CO5	K3
	(OR)			

10.	A random sample of 10 ball bearings produced by a company have a mean diameter of0.5060 cm with *s.d* 0.004 cm. calculate the maximum error estimate *E* and 95% confidence interval for the actual mean diameter of ball bearings produced by this company assuming sampling from normal population.	10	CO5	K3

UNIT-VI

11.	It has previously been recorded that the average depth of ocean at a particular region is 67.4fathoms. Is there reason to believe this at 0.01L.O.S. if the readings at 40 random locations in that particular region showed a mean of 69.3with *s.d*. of 5.4 fathoms?	10	CO6	K4

(OR)

12.	A survey was conducted to determine whether three categories of employees prefer pension scheme or not resulting the table given below:	10	CO6	K4

	Teaching	Non-Teaching	Adminis-trative	Totals
For pension	67	84	109	260
Against pension	33	66	41	140
Totals	100	150	150	400

At 0.01 *L.O.S.* test whether the proportions of employees favouring pension scheme are same.

AR18

CODE: 18MET204 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Supplementary Examinations, August, 2023

STRENGTH OF MATERIALS

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1.	a)	Draw the stress strain curve for mild steel mark the salient features	6M
	b)	A mild steel rod 20mm diameter and 300mm long is enclosed centrally inside a hallow copper tube of same length, external diameter 30mm and internal diameter 25mm.The end of the tube are brazed together and the composite bar is subjected to axial pull of 40kN. If E for steel and copper is 200 GN/m^2 and 100 GN/m^2 respectively .Find the stress developed in the rod the tube find the extension of the rod.	6M

(OR)

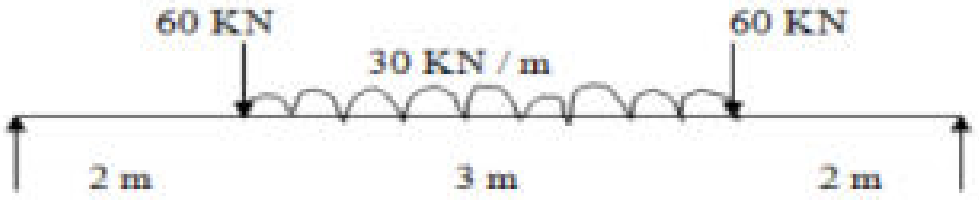
2.	a)	Derive equation for the relation between three elastic constants i.e. E, G and K.	6M
	b)	A bar of 25 mm. diameter is subjected to a pull of 70 kN. The extension measured on a gauge length of 200 mm is 0.1 mm and change in diameter is 0.004 mm. Find poisson's ratio and values of three elastic constants i.e. E, G and K	6M

UNIT-II

3.	a)	Derive the expressions for the circumferential stress and longitudinal stress for thin cylindrical shell subjected to internal pressure 'p'.	6M
	b)	A Thin cylindrical shell 3 m long has 1m internal diameter and 15 mm metal thickness. Calculate the circumferential and longitudinal stresses induced and also the change in the dimensions of the shell, if it is subjected to an internal pressure of1.5 N/mm^2 Take E = $2x10^5$N/mm^2 and Poisson's ratio =0.3. Also calculate change in volume.	6M

(OR)

4.	a)	Derive relation between SF,BM and rate of loading at a section of beam.	4M
	b)	Construct S. F. D & B. M. D for the simply supported beam shown in below figure.	8M



UNIT-III

5. a) State the theory of simple bending? What are the assumptions made in the theory of simple bending? 4M

   b) An I – section beam 350mm × 250mm has a web thickness of 12mm and flange thickness of 20mm. It carries a shear force of 120KN. Sketch the shear stress distribution across the section. 8M

(OR)

6. a) Derive an expression for shearing stress at a section of loaded beam? 4M

   b) A steel plate is bent into a circular arc of radius 12 metres. If the plate section be 100 mm wide and 20 mm thick find the maximum stress induced and the bending moment which can produce this stress. Take E = 2 x 10^5 N/mm^2 . 8M

UNIT-IV

7. a) Derive an expression for the Euler's critical buckling load of a column with both ends are hinged. 4M

   b) A solid shaft running at 160 rpm has to transmit 100 KW of power. The material must not be stressed beyond 60 N/mm^2 and the shaft must not twist more than 1° in a length of 3 metres. Select a suitable diameter for the shaft. 8M

(OR)

8. A hollow shaft is required to transmit 600 kW at 110 r.p.m., the maximum torque being 20% greater than the mean. The shear stress is not to exceed 63 MPa and twist in a length of 3 metres not to exceed 1.4 degrees. Find the external diameter of the shaft, if the internal diameter to the external diameter is 3/8. Take modulus of rigidity as 84 GPa. 12M

UNIT-V

9. a) What are the limitations of the moment area method? 4M

   b) A simply supported beam AB of span 4 metres is carrying a uniformly distributed load of 2kN/m over the entire span. Find the maximum slope and deflection of the beam. Take EI = 80 X 10^9 N-mm^2. 8M

(OR)

10. A simply supported beam of span 5 m, carrying a point load of 5 kN at a distance of 3 m from the left end. Find (i) slope at the left support, (ii) deflection under the load and (iii) maximum deflection. Take E= 2x10^5 N/mm^2 and I = 1x10^8 mm^4 .Use double integration method. 12M

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AR18

CODE: 18ECT207 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Supplementary Examinations, August, 2023

ELECTRO MAGNETIC WAVES & TRANSMISSION LINES

(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1.	a)	Explain about different types of charge distributions.	6M
	b)	Explain the electric field intensity due to circular ring	6M
		(OR)	
2.	a)	Derive the Expression for electric field intensity due to infinite line charge?	6M
	b)	Define electric flux density and derive the equations of Gauss law in differential form	6M

UNIT-II

3.	a)	State and Explain about Biot-Savart's law with different current sources	6M
	b)	Explain H field due to coaxial transmission line using Ampere's law	6M
		(OR)	
4.	a)	Derive the equation of Force on moving charge due to electric and magnetic fields	6M
	b)	A thin ring of radius 5cm is placed on plane z =1cm so that its center is at (0,0,1cm). If the ring carries 50mA along a_{φ}. Find H at (0,0,-1cm) and (0,0,10cm).	6M

UNIT-III

5.	a)	Write down Maxwell's equations in differential form and integral form	6M
	b)	What is the Faraday's law of induction and Explain the significance of transformer e.m.f.	6M
		(OR)	
6.	a)	Derive the boundary conditions for the tangential and normal components of Electrostatic fields at the boundary between two perfect dielectrics.	8M
	b)	Explain displacement current density	4M

UNIT-IV

7.	a)	State and prove pointing theorem.	6M
	b)	Define Uniform plane waves and obtain the relation between E&H.	6M
		(OR)	
8.	a)	Explain the wave Propagation in Good Dielectric Media.	6M
	b)	Explain the linear polarization, circular polarization and elliptical polarization	6M

UNIT-V

9.	a)	Derive a relation between reflection coefficient and characteristic impedance	6M
	b)	Explain the condition of a loss less line	6M
		(OR)	
10.	a)	Explain short circuited and open circuited transmission lines	6M
	b)	Discuss the stub matching techniques of impedance matching.	6M

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AR18

CODE: 18BST205 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Supplementary Examinations, August, 2023

Probability and Statistics with R

(Common to CSE and IT)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. A box contains 100 transistors , 20 of which are defective and 10 are selected at random , find the probability that (i) all are defective (ii) all are good (iii) at most 2 are defective — 12 M

(OR)

2. a) Find the moment generating function for binomial distribution. — 6 M
   b) Fit a binomial distribution to the following data. — 6 M

x	0	1	2	3	4	5
f	42	33	14	6	4	1

UNIT-II

3. If the probability density function is $f(x) = e^{-x}$ for $x > 0$, then find mean and variance of X — 12M

(OR)

4. a) Find (i) mean (iii) variance of the Distribution — 6 M

$$f(x) = \frac{k}{x^2+1} \quad if \; -\infty < x < \infty$$

   b) Obtain the moment generating function of normal distribution — 6 M

UNIT-III

5. a) A random sample of 400 items is found to be have mean 82 and S.D of 18 Find the maximum error estimate of 95% confidence interval. — 6 M
   b) Let S = □3,,6,9,15,27□□, find the probability distribution of the sample mean for a random sample size three drawn without replacement and also find (i) The mean of the sampling distribution of means (ii) The standard deviation of the sampling distribution of means — 6 M

(OR)

6. Samples of size 2 are taken from the population 4,8,12,16,20,24 with replacement. Find — 12 M
   a) The mean of the population
   b) The standard deviation of the population
   c) Mean of the sampling distribution of means
   d) The standard deviation of the sampling distribution of means

UNIT-IV

7. a) Write the procedure for testing of the hypothesis. 6 M
   b) Find the maximum error estimate with 95% confidence if the sample proportion (p) is 0.5775 for 400 samples 6 M

(OR)

8. a) Give an example for Type-I and Type-II errors 6 M
   b) A random sample of 400 items is found to be have mean 82 and S.D of 18 Find the maximum error estimate of 95% confidence interval 6 M

UNIT-V

9. a) Fit the linear curve y = a+bx for the following data and also estimate y(4) for the following data. 6 M

x	1	2	3	4	5	6
y	6	4	3	5	4	2

   b) Fit the curve $y = ae^{bx}$ for the following data and also estimate y(2.4) for the following data. 6 M

x	2	4	6	8	10	12
y	1.8	1.5	1.4	1.1	1.1	0.9

(OR)

10. a) Find the rank correlation for the following data. 6 M

x	2	4	5	6	8	11
y	18	12	10	8	8	5

    b) Calculate the two regression lines from the following data. 6 M

x	12	10	14	11	12	9
y	18	17	23	19	20	15

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AR18

CODE: 18BST204 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Supplementary Examinations, August, 2023

Complex Variables and Statistical Methods

(CIVIL ENGINEERING)

Time: 3 Hours **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) Find the harmonic conjugate of the function $u(x,y) = x^3 - 3xy^2 - 5y$. 6M
   b) Show that the complex function $f(z) = 2x^2 + y + i(y^2 - x)$is not analytic at any point. 6M

2 a) Determine the analytic function by using Milne-Thomson rule, where the real parts is $u = x^3 - 3xy^2 + 3y^2 + 1$ 6M
   b) Let, f be an entire function and $\mathrm{u(x,y)} = x^4+y^4 - 6x^2y^2 - 4xy$. Show that it is harmonic in C. 6M

UNIT-II

3. a) Find the Laurent expansion for $f(z) = \frac{\sin z}{z^2} (|z| > 0)$ 6M
   b) Define: Poles 6M

(OR)

4. a) Find the essential singular point of the function $f(z) = e^{\frac{1}{(z-3)}}$ 6M
   b) Evaluate the residue theorem of the function $\oint \frac{1}{(z-1)^2(z-3)} dz$, where the contour C is the rectangle defined by $\mathrm{x} = 0, \mathrm{x} = 4, \mathrm{y} = -1, \mathrm{y} = 1$. 6M

UNIT-III

5. a) For a certain normal distribution, the first moment about 10 is 40 and the fourth moment about 50 is 48. What is the arithmetic mean and standard deviation of the distribution 6M
   b) A continuous random variable X has a probability density function $f(x) = 3x^2, 0 \le x < 1$. Find a and b such that i)$P\{X \le a\} = P\{X > a\}, and$ ii) $P\{X > b\} = 0.05$. 6M

(OR)

6. a) The marks obtained by a number of students for a certain subject are assumed to be approximately normally distributed with mean value 65 and with a standard deviation of 5. If students are taken at random from this set what is the probability that exactly 2 of them will have marks over 70? 6M
   b) A probability curve $y = f(x)$ has a range from 0 to ∞. If $f(x) = e^{-x}$, find the mean and variance and the third moment about mean 6M

UNIT-IV

7. Two horses A and B were tested according to the time(in seconds) to run a particular track with the following results 12M

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	--

Test whether the two horses have the same running capacity

(OR)

8. a) It is very important that a certain solution in a chemical process have a pH of 8.30. The method used gives measurements which are approximately normally distributed about the actual pH of the solution with a known standard deviation of 0.020. We decide to use 5% as the critical level of significance. 6M
a) Suppose a single determination shows pH of 8.32.
b)Suppose that now our sample consists of 4 determinations giving values of 8.31, 8.34, 8.32, 8.31.

b) The strength of steel wire made by an existing process is normally distributed with a mean of 1250 and a standard deviation of 150. A batch of wire is made by a new process, and a random sample consisting of 25 measurements gives an average 216 Statistical Inferences for the Mean strength of 1312. Assume that the standard deviation does not change. Is there evidence at the 1% level of significance that the new process gives a larger mean strength than the old? 6M

UNIT-V

9. Fit a straight line to the following data 12M

x	1	2	3	4	5
y	14	27	40	55	68

(OR)

10. a) The following are the average weekly losses of worker-hours due to accidents in 10 industrial plants before and after a certain safety program was put into operation 6M

Before:	42	73	46	124	33	57	83	34	26	17
After:	36	60	44	119	35	51	77	29	24	11

Use the 0.05 level of significance to test whether the safety program is effective. Concerning losses of worker-hours before and after safety programs in 10 industrial plants. Calculate r_s.

b) Test the null hypothesis where, n = 10 and r = 0.732, $\rho = 0$ against the null hypothesis $\rho \neq 0$ at the 0.05 level of significance. 6M

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AR16

CODE: 16EC2008 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech II Semester Supplementary Examinations, August, 2023
ELECTROMAGNETIC FIELD THEORY AND TRANSMISSION LINES
(ELECTRONICS AND COMMUNICATION ENGINEERING)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) State and Explain coulomb's law. **7M**
   b) Derive Poisson's and Laplace equations from fundamentals. **7M**

(OR)

2. a) A square conducting loop of side '2a' lies in z = 0 plane and carries a current I in the counterclockwise direction. Find **H** at the center of the loop. **7M**
   b) A hollow conducting cylinder has a inner radius 'a' and outer radius 'b' and carries a current 'I' along the positive z-direction. Find **H** everywhere. **7M**

UNIT-II

3. a) State Ampere's circuital law. Specify the conditions to be met for determining magnetic field strength **H** based on Ampere's circuital law. **7M**
   b) State and explain the Biot-Savart's law relating magnetic field produced at a point due to the current in a small elemental wire. **7M**

(OR)

4. a) Two infinitely long parallel conductors are separated by a distance 'd'. Find the force per unit length exerted by one of the conductor on the other if the currents in the two conductors are I1 and I_2. **7M**
   b) An infinitely long straight conducting rod of radius 'a' carries a current of **I** in positive Z direction. Using Ampere's circuital law, find **H** in all regions and sketch the variation of **H** as a function of radial distance. If is I=3mA and a=2cm, find **H** and **B** at (0, 1cm, 0) and (0, 4cm, 0) **7M**

UNIT-III

5. a) State the Faraday's laws of electromagnetic induction and derive the expressions for the transformer and motional e.m.f.s. **8M**

   b) Explain the concept of displacement current and obtain an expression for the displacement current density. **6M**

(OR)

6. a) Write the Maxwell's equations in point and integral form for time varying fields? **8M**

   b) Derive the boundary conditions between media having dielectric and conductor. **6M**

UNIT-IV

7. a) Discuss about reflection and refraction of plane waves for normal incidence at the interface between two dielectrics. **8M**

   b) Derive the wave equation in **E** and **H** for free space conditions. **6M**

(OR)

8. a) State and prove Poynting theorem. Explain its significance **8M**

   b) In free space ($z \leq 0$), a plane wave with **Hi** = 10 $\cos(10^8 t - \beta z)$**ax** mA/m is incident normally on a lossless medium ($\varepsilon = 2\varepsilon_0$, $\mu = 8\mu_0$) in the region $z \geq 0$. Determine the reflected wave **Hr**, **Er** and the transmitted wave **Ht**, **Et**. **6M**

UNIT-V

9. a) A 100Ω loss less line connects a signal of 100 KHz to load of 140 Ω. The load power is 100mW. Calculate (i) Voltage reflection coefficient (ii) VSWR (iii) Position of V_{max}, I_{max}, V_{min} and I_{min}. **8M**

   b) Write the applications of smith chart. **6M**

(OR)

10. a) Derive an expression for Reflection coefficient when a wave is incident on a dielectric obliquely with parallel polarization. **8M**

    b) Discuss about Single and Double stub matching. **6M**

AR16

CODE: 16CS2007 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Supplementary Examinations, August, 2023

Formal Languages and Automata Theory

(COMMON TO CSE & IT)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) What are the differences between DFA and NDFA? **7M**
   b) Given an Epsilon NFA transition table or transition diagram, task is to convert the ϵ-NFA to NFA. **7M**
   Transition Table:

	$\in$	a	b	c
$\rightarrow p$	{ q, r }	$\emptyset$	{ q }	{ r }
q	$\emptyset$	{ p }	{ r }	{ p,q }
* r	$\emptyset$	$\emptyset$	$\emptyset$	$\emptyset$

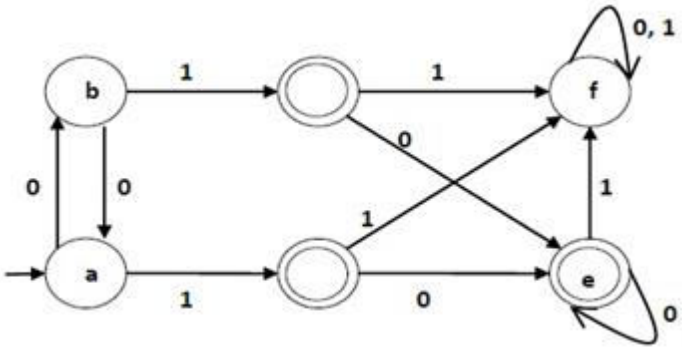
(OR)

2. a) Define the closure properties of NFA. **7M**
   b) Conversion from Mealy to Moore Machine for the following table. **7M**

	Input=0		**Input=1**	
Present State	**Next State**	**Out put**	**Next St ate**	**Output**
q0	q1	0	q2	0
q1	q1	0	q2	1
q2	q1	1	q2	0

UNIT-II

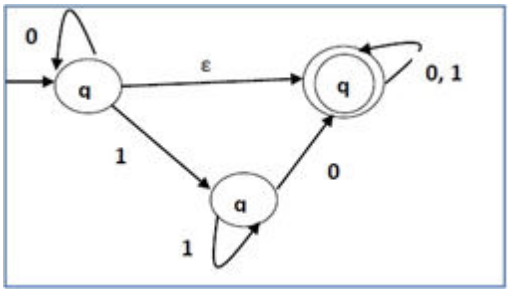
3. a) Explain the Identities Related to Regular Expressions. **7M**
   b) State and explain DFA Minimization using Myphill-Nerode Theorem with the following example. **7M**



(OR)

4. a) Prove that $\mathbf{L = \{a^i b^i \mid i \geq 0\}}$ is not regular. **7M**

b) Convert the following NFA-ε to NFA without Null move. **7M**



UNIT-III

5. a) Define context-free grammar. Explain with example. **7M**

b) Let a CFG {N,T,P,S} be N = {S}, T = {a, b}, Starting symbol = S, P = S → SS | aSb | ε . Define Leftmost derivation from the above CFG is "abaabb" **7M**

(OR)

6. a) Find out whether the language $\mathbf{L = \{x^n y^n z^n \mid n \geq 1\}}$ is context free or not. Using Pumping lemma theorem. **7M**

b) Convert the following CFG into CNF **7M**

S → XY | Xn | p X → mX | m Y → Xn | o

UNIT-IV

7. a) Explain the Basic Structure of PDA. **7M**

b) Construct a PDA that accepts $\mathbf{L = \{0^n 1^n \mid n \geq 0\}}$ **7M**

(OR)

8. a) Consider the following PDA which accepts L by empty stack and convert it into equivalent PDA which accepts L by final state. **7M**

M = ({q_0, q_1}, {a, b}, {B, z_0}, δ, q_0, z_0, Φ) where δ is given by

δ (q_0, a, z_0) = (q_0, Bz_0)

δ (q_0, a, B) = (q_0, BB)

δ (q_0, b, B) = (q_1, ε)

δ (q_1, b, B) = (q_1, ε)

δ (q_1, ε, z_0) = (q_1, ε)

the above PDA accepts L = {a^n b^n / n ≥ 1} by empty stack

b) Consider a PDA M=({s,p,q},{a, c},{a, z_0}, δ, s, z_0, p) which accepts language L={a^ncb^n/n > = 1} by final state, where δ is defined as follows **7M**

δ (s, a, z_0) = (s, az_0)

δ (s, a, a) = (s, aa)

δ (s, c, a) = (q, a)

δ (q, a, a) = (q, ε)

δ (q, ε, z_0) = (p, z_0)

Construct an equivalent PDA M^1 which accepts L in empty stack

UNIT-V

9. a) Write a short note on the model of Turing Machine (TM). **7M**

b) Design a Turing Machine that reads a string representing a binary number and erases all leading 0's in the string. However, if the string comprises of only 0's, it keeps one 0. **7M**

(OR)

10. a) What is Universal Turing Machine? Explain it. **7M**

b) Explain the linear bounded Turing machine. **7M**

AR16

CODE: 16BS2007 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Supplementary Examinations, August, 2023

COMPLEX VARIABLES AND SPECIAL FUNCTIONS

(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. Show that the function $f(z)=\frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}$ is not analytic at the origin, although C-R equations are satisfied at that point. 14M

(OR)

2. a) Find an analytic function whose real part is x^2-y^2-x using Milne - Thompson method 7M
   b) Show that both the real and imaginary parts of an analytic function are harmonic 7M

UNIT-II

3. a) Evaluate $\int_0^{1+i}(x^2-iy)dz$, along the parabola $y=x^2$ 7M
   b) Consider the region $1\le|z|\le 2$. If B is the positively oriented boundary of this region show that $\int_B \frac{dz}{z^2(z^2+16)}=0$ 7M

(OR)

4. Evaluate $\int_0^{1+i}(x-y+ix^2)dz$ 14M
   i) along the straight line from $z=0$ to $z=1+i$.
   ii) along the real axis from $z=0$ to $z=1$ and then along a line parallel to imaginary axis from $z=1$ to $z=1+i$.

UNIT-III

5. Expand $f(z)=\frac{1}{z^2-3z+2}$ in the region $(i)0<|z-1|<1.(ii)1<|z|<2.$ 14M

(OR)

6. a) Obtain the Laurent's series expansion of $f(z)=\frac{e^z}{z(1-z)}$ about $z=1$ 7M

   b) Define zeros and poles and determine the zeros and poles of $\left(\frac{z+1}{z^2+1}\right)^2$ 7M

UNIT-IV

7. Find the residues of $f(z)=\frac{z^2}{(z-1)(z-2)^2}$ at each pole. 14M

(OR)

8. Using complex variable technique evaluate $\int_0^{\pi}\frac{d\theta}{a+b\cos\theta}=\frac{\pi}{\sqrt{a^2-b^2}}\ (a>b>0)$ 14M

UNIT-V

9. Prove that $\int_0^1\frac{x^2}{\sqrt{1-x^4}}dx\times\int_0^1\frac{1}{\sqrt{1+x^4}}dx=\frac{\pi}{4\sqrt{2}}$ 14M

(OR)

10. a) When n is a positive integer, prove that $2^n\Gamma\left(n+\frac{1}{2}\right)=1.3.5...(2n-1)\sqrt{\pi}$ 7M

    b) Show that $\Gamma\left(\frac{1}{2}\right)=\sqrt{\pi}$ 7M

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AR18

CODE: 18EST103 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

II B.Tech II Semester Supplementary Examinations, Aug 2023

ENGINEERING MECHANICS

(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 Hours **Max Marks: 60**

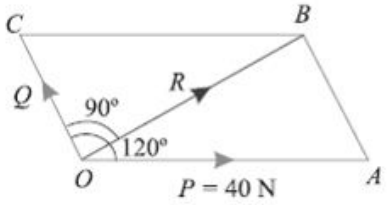
Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

UNIT-I

1. a) Classify the system of forces and write a short note on it. 6M
   b) The following forces act at a point : 6M
   (i) 20 N inclined at 30° towards North of East,
   (ii) 25 N towards North,
   (iii) 30 N towards North West, and
   (iv) 35 N inclined at 40° towards South of West.
   Find the magnitude and direction of the resultant force.

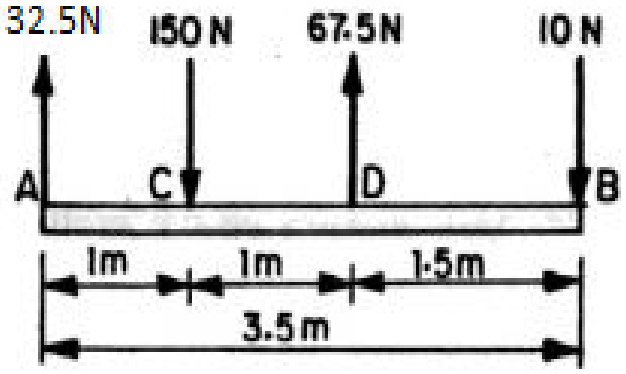
(OR)

2. a) Derive an expression for parallelogram law of force. 6M
   b) Two forces act at an angle of 120°. The bigger force is of 40 N and the resultant is perpendicular to the smaller one. Find the smaller force. 6M



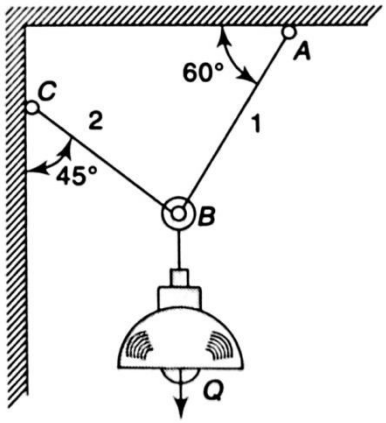
UNIT-II

3. A system of parallel forces acting on a rigid bar as shown in Fig.2. reduce this system to 12M
   i). A single force
   ii). A single force and a couple at A
   iii). A single force and a couple at B



(OR)

4. a) A electrical light fixture of weight Q = 178N is supported as shown in fig. Determine the tensile forces S1 and S2 in the wires BA and BC if their angles of inclination as shown in fig 6M

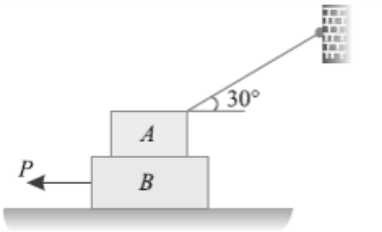


b) Show that if three coplanar forces, acting at a point be in equilibrium, then, each force is proportional to the sine of the angle between the other two. 6M

UNIT-III

5. a) Define coefficient of friction and limiting friction and How will you distinguish between static friction and dynamic friction? 6M

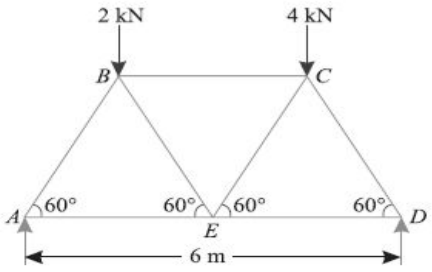
b) Two blocks A and B of weights 1 kN and 2 kN respectively are in equilibrium position as shown in Fig. 6M



If the coefficient of friction between the two blocks as well as the block B and the floor is 0.3, find the force (P) required to move the block B.

(OR)

6. A Warren girder consisting of seven members each of 3 m length freely supported at its end points. 12M

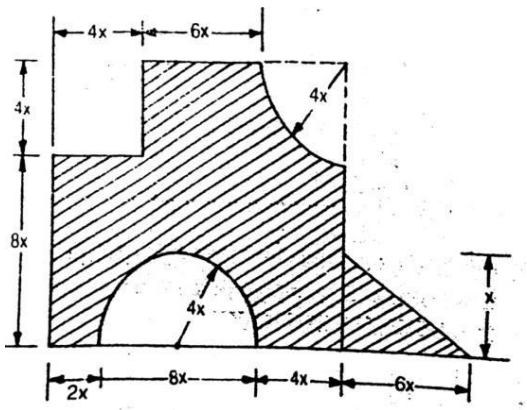


The girder is loaded at B and C as shown. Find the forces in all the members of the girder indicating whether the force is compressive or tensile.

UNIT-IV

7. a) Determine the coordinates of centroid for semi circular lamina. 6M

   b) Determine the centroid of the shaded area as shown in fig. Take x =10mm 6M



(OR)

8. a) State and prove the perpendicular axis theorem 6M
   b) Find the moment of inertia of triangular lamina with base 'b' and height 'h' 6M

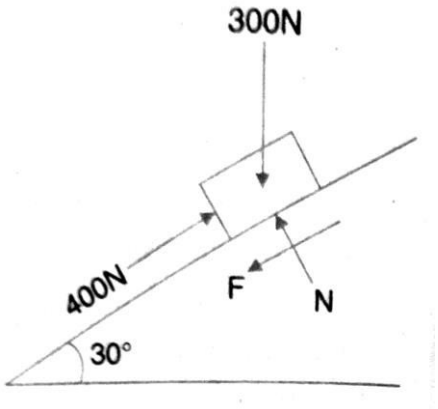
UNIT-V

9. a) A car enters a curved portion of the road of radius 200 m travelling at a constant speed of 36 km/hour. Determine the components of velocity and acceleration of the car in the x and y directions 15 seconds after it have entered the curved portion of the road. Also express the velocity and the acceleration of the car in terms of the normal and tangential components. 6M

   b) Define and write an expression for normal and tangential accelerations of a particle. 6M

(OR)

10. a) Define curvilinear motion of a particle, plane motion of a rigid body and radius of gyration 6M
    b) A body weighing 300 N is pushed up a 30° plane by a 400 N force acting parallel to the plane. If the initial velocity of the body is 1.5 m/sec and coefficient of kinetic friction is $\mu = 0.2$, what velocity will the body have after moving 6 m as shown in fig. 6M



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