AR20

CODE: 20ECT206 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

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

ANALOG COMMUNICATIONS

(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	Define modulation? What are the need for modulation	5	CO1	L1
	b	Explain the generation of AM Wave using Switching modulator	5	CO1	L2
		(OR)			
2.	a	Derive the expression for single tone Amplitude modulated wave	5	CO1	L4
	b	An audio signal is given as 15 $\sin(2\pi x1500t)$ amplitude modulated carrier is given as $60\sin(2\pi x10000t)$. Sketch audio, carrier and Amplitude modulated signal. Determine the modulated index. Write the spectrum of modulated wave.	5	CO1	L4
		UNIT-II			
3.	a	Explain how ring modulator can be used to generate DSB-SC modulation	5	CO2	L2
	b	Explain the generation of SSB-SC wave using phase discrimination method with help of a neat functional diagram.	5	CO2	L2
		(OR)			
4.	a	Explain the Coherent detection of DSB-SC Modulated wave	5	CO2	L2
	b	Explain single tone modulation for transmitting only upper side band (USB) frequency of SSB modulation .	5	CO2	L2
		UNIT-III			
5.	a	Explain the Armstrong method for the generation of Wideband FM	5	CO3	L3
	b	A carries is frequency modulated by a sinusoidal signal of frequency 2 K Hz. The frequency deviation is 6KHz, determine modulation index and bandwidth. If the amplitude of the message signal is increased by a factor of 3 and its frequency is decreased to 1KHz, determine the modulation index and bandwidth.	5	CO3	L4
		(OR)			
6.	a	Derive the mathematical expression for a single tone frequency modulated wave	5	CO3	L3
	b	Write the difference between Narrow Band FM and Wide Band FM	5	CO3	L3
		UNIT-IV			
7.	a	With the aid of the block diagram explain TRF receiver. List out the advantage and disadvantages of TRF receiver.	5	CO4	L3
	b	With a neat sketch of block diagram explain the operation of AM transmitter.	5	CO4	L3
		(OR)			
8.	a	In a broadcast super heterodyne AM receiver having no RF stage, the loaded Q of the aerial coupling circuit at the input of mixer is 125. If the intermediate frequency is 465 kHz. Calculate image frequency and rejection ration at 12 MHz.	5	CO4	L4
	b	Draw the block diagram of superhetrodyne receiver and explain its operation.	5	CO4	L3
		UNIT-V			
9.	a	Explain generation of PAM with neat sketches	5	CO5	L2
	b	Compare PAM, PWM and PPM pulse modulation techniques	5	CO5	L2
		(OR)			
10.	a	What sampling rate and sampling interval would be appropriate for a television video channel with a maximum bandwidth of 4 MHz? ..	5	CO5	L2
	b	What is the need for pulse modulation systems?	5	CO5	L2
		UNIT-VI			
11.	a	Explain the concept of Time division multiplexing in communication?	5	CO6	L2
	b	Explain the noise performance of DSB - SC receiver and prove its S/N Ratio is unity.	5	CO6	L2
		(OR)			
12.	a	Derive an expression for SNR output of FM system	5	CO6	L3
	b	Distinguish between pre emphasis and de-emphasis with neat figures	5	CO6	L3

AR20

CODE: 20MET206 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

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

MANUFACTURING TECHNOLOGY-1

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.	a	What is casting? Discuss the advantages, limitations of casting?	5	1	Remembering
	b	. Explain pattern allowances with neat sketch	5	1	Understanding
		(OR)			
2.	a	Explain the zones of cupola and chemical reactions during melting	5	1	Understanding
	b	Explain the defects in casting and their remedies	5	1	Remembering
		UNIT-II			
3.	a	Explain types rises in casting with neat sketches	5	2	Understanding
	b	A cylindrical riser of 6cm diameter and 6 cm height has to be designed for a sand casting mould for producing a steel rectangular plate casting of 7cmx10cmx2cm dimensions having the total solidification time of 1.36 minute. Find the solidification time (in minute) of the riser	5	2	Understanding
		(OR)			
4.	a	Explain the semi centrifugal casting with an neat sketch	5	2	Remembering
	b	Discuss precision investment casting process, advantages and applications of the process	5	2	Remembering
		UNIT-III			
5.	a	Explain principle of TIG welding with suitable sketches and their applications	5	3	Understanding
	b	Explain principle of submerged arc welding with suitable sketches and their applications	5	3	Understanding
		(OR)			
6.	a	Explain the principle of resistance welding process and its application	5	3	Understanding
	b	Write down the welding defects and remedies	5	3	Applying
		UNIT-IV			
7.	a	Differentiate hot working and cold working processes	5	4	Understanding
	b	If the maximum reduction in rolling of slab is from 25 to 20mm.Calculate the value of coefficient of friction. Take the roll diameter as 500mm.Also find the length of projection of arc of contact.	5	4	Analysing
		(OR)			
8.		Define extrusion process. Explain Hydrostatic with suitable sketches.Discuss its advantages	10	4	Understanding
		UNIT-V			
9.		Define forging. Explain smith forging, Press forging with neat sketches	10	5	Understanding
		(OR)			
10.	a	Explain following sheet metal working operations (i)Punching (ii)Blanking (iii) Embossing	4	5	Understanding
	b	For punching a 10mm circular hole and cutting a rectangular blank of 50X 200 mm from a sheet of 1mm thickness (Mild steel , Shear stress=240N/mm^2). Calculate in each case (i) Size of punch (ii) Size of die (iii) Force required	6	5	Understanding
		UNIT-VI			
11.		Explain following methods with suitable figures (a) High velocity forming methods (b) Explosive forming	10	6	Understanding
		(OR)			
12.		Explain following techniques with neat sketch (a) Injection moulding (b)Blow moulding	10	6	Understanding

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CODE: 20EET206 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

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

A.C.MACHINES

(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.	a.	How the Rotating magnetic field produced in the 3-Phase Induction Motor, Explain with phase diagram.	5	1	1
	b	A three phase, 50Hz, 6 pole induction motor runs at 960 RPM while driving full load. If the emf and reactance are 185V and 40 Ohms respectively on rotor while it is at rest, Calculate (i) slip, (ii) rotor frequency (iii) rotor emf (iv) rotor reactance while running.	5	1	3
		(OR)			
2.	a	Develop the Torque equation in three phase induction motor	5	1	3
	b	Explain the torques slip characteristics three phase induction motor	5	1	2
		UNIT-II			
3.	a	List the different starting methods of Three phase Induction motor. Explain the any two methods.	10	2	1
		(OR)			
4.	a	List the different speed controls of three phase induction motor, explain any one method	5	2	2
	b	What is induction generator; How induction motor converted into Generator, sketch the torque slip characteristics.	5	2	
		UNIT-III			
5.	a	A 16-pole, three phase, 50Hz, star connected alternator has 144 slots and 10 conductors per slot. The flux per pole is 0.03 Wb. The armature coil is short chorded by 2 slots. If the field is driven at synchronous speed, determine the generated e.m.f.	10	3	3
		(OR)			
6.	a.	Derive the EMF equation of alternator in terms of pitch and distribution factors.	5	3	2
	b	Construct the phasor diagrams of an alternator at lagging power factor, leading power factor and unity power factor. Consider the armature resistance in the phasor diagram.	5	3	3
		UNIT-IV			
7.	a	Define voltage regulation of an alternator and explain how it is determined through Synchronous impedance method? Also justify why it is called pessimistic approach?	10	4	2
		(OR)			
8.	a	A three phase, star connected, 1.5MVA, 11kV alternator has armature resistance and synchronous reactance of 1.2ohm and 25ohm per phase respectively. Determine the voltage regulation at 0.8 lagging power factor and at 0.9 leading power factor through emf method?	10	4	3
		UNIT-V			
9.	a	Explain why synchronous motors are not self-starting?	5	5	2
	b	List the methods of starting synchronous motor under no load and Explain any one method	5	5	1
		(OR)			
10.	a	Explain V-curves and inverted-V curves of a synchronous motor?	10	5	2
		UNIT-VI			
11.	a	Explain the operation of single phase single winding induction motor as per double revolving field theory	10	6	2
		(OR)			
12.		List various types of single phase Induction motors , Explain their working in brief.	10	6	1

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CODE: 20CET206 SET-2

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

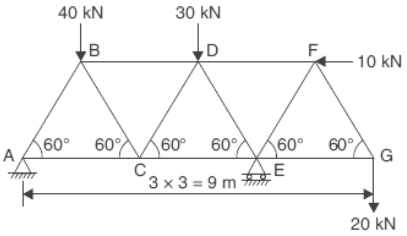
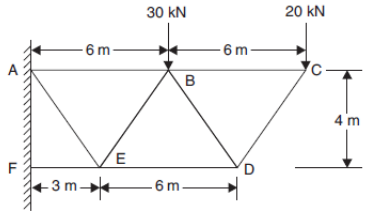
II B.Tech.II Semester Supplementary Examinations, August,2023

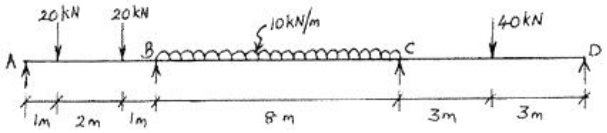
Structural Analysis

(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.	a	Analyse the truss shown in Fig. All the members are of 3 m length 	8M	CO1	3
	b	Classify pin jointed frames based on configuration and support conditions.	4M	CO1	2
		(OR)			
2.	a	Determine the forces in all the members of the frame shown in Fig. Indicate the nature of the forces also. 	8M	CO1	3
	b	Differentiate between method of sections and method of joint analysis approaches.	4M	CO1	2
		UNIT-II	Marks	CO	Blooms Level
3.		A beam AB 6 m long is fixed at A and simply supported at B. The beam carries point loads 18 kN and 36 kN at distances 2m and 4 m respectively from end A. Find what couple should be applied at the end B so as to completely neutralize the moment at A.	12M	CO1	3
		(OR)			
4.		A fixed-fixed beam of span 5 metres carries a point load of 100 kN at the centre and point loads of 40 kN at 2m from each end. Find the maximum positive and negative moments. Draw also the bending moment and shear force diagrams	12M	CO2	3
		UNIT-III	Marks	CO	Blooms Level
5.	a	Derive an expression for strain energy due to bending.	8M	CO3	3
	b	Define Strain energy. Derive an expression for strain energy due to axial force.	4M	CO3	2
		(OR)			
6.	a	A beam AB of length 4.5 m simply supported at the ends carries a point load 30 kN at a distance 3m from the left end. $I_{xx} = 55x10^{-6}$ m^4 and E = 200 GN/m^2. Find the deflection under the load.	8M	CO3	3
	b	Find the strain energy stored in simply supported beam carrying a point load 'W' at the centre of beam of span 'L'.	4M	CO3	3

		Marks	CO	Blooms Level
	UNIT-IV			
7.	A three-hinged parabolic arch has a span of 24 m and a rise to the central hinge of 4m. The arch is loaded with two vertical 20 kN loads symmetrically situated on either side of the central hinge at 3 m horizontally from the hinge. Calculate the Support reactions and value of maximum positive bending moments occurs in the arch	12M	CO4	3
	(OR)			
8.	A two hinged parabolic arch of span L has central rise of one-fourth of the span. Show that the horizontal thrust on the arch due to a point load of 'W' at its quarter span is 5W/8. Take $I = I_o \text{ Sec } \theta$.	12M	CO4	3
	UNIT-V	Marks	CO	Blooms Level
9.	Derive Clapyeron"s Three moment theorem for continuous beam.	12M	CO5	3
	(OR)			
10.	Determine the support moments and reactions for the three span continuous beam shown in Figure 2 using Clapeyron's theorem of three moments. Assume EI as constant. Also sketch the BMD and SFD. 	12M	CO5	3
	UNIT-VI	Marks	CO	Blooms Level
11.	A simply supported beam has a span of 16 m is subjected to a UDL (dead load) of 5 kN/m and a UDL (live load) of 8 kN/m (longer than the span) traveling from left to right. Draw the ILD for shear force and bending moment at a section 4 m from the left end. Use these diagrams to determine the maximum shear force and bending moment at this section.	12M	CO6	3
	(OR)			
12.	A single rolling load of 120kN rolls along a girder of 12m span. Draw the diagrams of maximum B.M and maximum positive & negative S.F and find the respective values	12M	CO6	3

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AR18

CODE: 18MET206 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

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

MANUFACTURING TECHNOLOGY -I

(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.	What are the different elements of the gating system? Explain the gating system design.	6M
	b.	Explain the design of risers in the casting process.	6M
		(OR)	
2	a.	Discuss the calculation of gating system dimensions for simple objects.	6M
	b.	Discuss the solidification of casting and its impact on the casting defects.	6M

UNIT-II

3	a.	Describe the principle of tungsten inert gas welding.	6M
	b.	Explain the working principle of submerged arc welding	6M
		(OR)	
4	a.	Explain the factors responsible for different types of weld defects	6M
	b.	Describe the different types of brazing, braze welding, and soldering.	6M

UNIT-III

5	a.	Give a short note on each category of rolling process with an appropriate diagram.	6M
	b.	Explain the concept 'Angle of bite' in a typical rolling process with neat sketch	6M
		(OR)	
6	a.	Describe the working principle of impact extrusion with suitable illustration.	6M
	b.	Give a short on different types of tube drawing with pictorial representation.	6M

UNIT-IV

7	a.	Classify forging operation and discuss *pros and cons* of each category.	6M
	b.	What is coining? Discuss the advantages and applications of coining	6M
		(OR)	
8	a.	Explain the different types of sheet metal working processes, with a special emphasis on embossing.	6M
	b.	Discuss the advantages and applications of cup drawing	6M

UNIT-V

9	a.	Explain the injection moulding process with the help of neat diagram	6M
	b.	Explain the blow moulding process with the help of neat diagram	6M
		(OR)	
10	a.	Explain the different types of additives used in plastics processing and their impact on the properties of plastics	6M
	b.	Explain the different types of plastics processing, with a special emphasis on blow moulding.	6M

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AR18

CODE: 18EET207 SET-2

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

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

ELECTRICAL MACHINES-II

(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)	Explain how rotating magnetic field is produced in 3 phase Induction motor .	6M
	b)	A 3-phase , 50Hz Induction motor has full load speed of 1440 rpm. Calculate the following(i) No.of poles (ii) Full load slip and rotor frequency (iii) Speed of rotor field w.r.t stator field.	6M

(OR)

2.	a)	Derive the expression for running torque in an three phase induction motor and also condition for maximum torque	6M
	b)	The slip ring rotor resistance and stand still reactance per phase of a 400V, 4-pole, 50Hz, 3-phase star connected induction motor is 0.02Ω and 0. 3Ω respectively. Calculate i) The speed at maximum torque ii) Ratio of full load torque to maximum torque	6M

UNIT-II

3.	a)	Explain any one starting method of Induction motors	6M
	b)	A 400V ,3-Phase , 50Hz star connected Induction motor has the following test results No-load test 400V 8.5 A 1100W Blocked Rotor Test 180V 45A 5799W. Calculate the line current and power factor when operating at 4% slip. The stator resistance per phase is 0.5Ω	6M

(OR)

4.	a)	Explain any one speed control method of Induction motor.	6M
	b)	Explain the operation of Induction Generator.	6M

UNIT-III

5.	a)	Derive the EMF equation of Synchronous Generator	6M
	b)	A 4-pole alternator has an armature with 25slots and 8 conductors per slot and rotates at 1500rpm and flux per pole is 0.05wb. Calculate the EMF generated if Windings factor is 0.96 and all conductors are in series.	6M

(OR)

6.	a)	Explain armature reaction and it's effects in Synchronous Generator.	6M
	b)	Calculate the rms value of the induced emf per phase of a 10pole , 3-phase , 50Hz alternator with 2- slots per pole per phase and 4 conductors per slot in two layers. The coil span is 150^0 The flux per pole is 0.12 wb.	6M

UNIT-IV

7.	a)	Explain the method of pessimistic to compute the voltage regulation of an alternator	6M
	b)	A 3-phase Star connected synchronous generator rated at 10KVA and 230V has a synchronous reactance of 1.2 Ω per phase and armature resistance of 0.5 Ω per phase. Calculate(i) The % voltage regulation at full load and 0.8 lagging power factor(ii) The power factor of load such that the voltage regulation is zero on full load.	6M

(OR)

8.	a)	Explain two reaction theory in case of Synchronous machine.	6M
	b)	Explain the Potier's Triangle method to compute the voltage regulation of an alternator	6M

UNIT-V

9.	a)	Explain the principle of operation of Synchronous motor with neat sketch.	6M
	b)	Explain the effect of load on synchronous motor.	6M

(OR)

10.	a)	Explain why the synchronous motor is not a self starting motor.	6M
	b)	Explain the starting methods of Synchronous motors.	6M

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AR18

CODE: 18CET209 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

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

Structural Analysis-I

(CIVIL ENGINEERING)

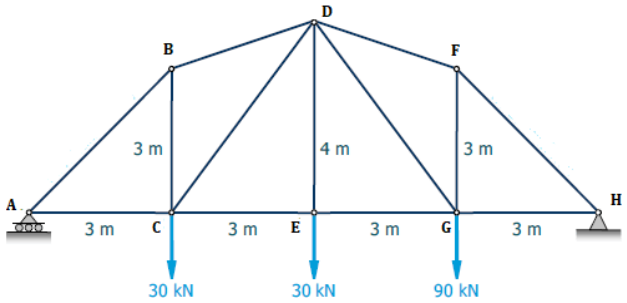
Time: 3 Hours **Max Marks: 60**

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) Differentiate between method of sections and method of joints — 4 M

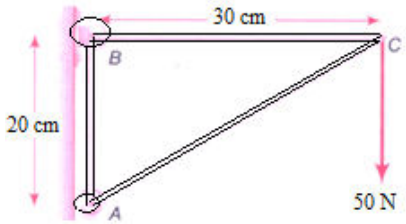
   b) Determine the force in members AB, BD, and CD of the truss shown in Fig. Also solve for the force on members FH, DF, and DG. — 8 M



(OR)

2. a) How do you recognize the zero members at a joint? — 4 M

   b) A simple lightweight truss *ABC* shown in the Figure is attached to a wall and holds a flowerpot weighing 50 N. Calculate the forces in each of its members, neglecting their own weight. — 8 M



UNIT-II

3. A Propped cantilever AB of span 6 m is fixed at A and propped at B. It is carrying a clockwise couple of 2 kNM and concentrated load of 4 kN at 2 m and 4 m from left support respectively. Determine support reactions and sketch SFD and BMD. — 12 M

(OR)

4. A Fixed beam of span 6m is carrying two point loads 5 kN at one third and two third points of given span. Determine support reactions and sketch SFD and BMD. — 12 M

UNIT-III

5. Derive clapeyron's three moment theorem. — 12 M

(OR)

6. A continuous beam ABC consists of spans AB and BC of lengths 8 m and 6 m respectively. A is fixed. The point B is simply supported, and end C is free. The span AB is subjected to a clockwise couple of 80 kN-m at its middle point and the span BC carries a point load of 40 kN at its middle point. Calculate the support reactions and support moments. Also sketch the bending moment diagram — 12 M

UNIT-IV

7. a) State Castigliano's first theorem and mention any two of its applications? — 4 M

   b) From first principles determine the maximum deflection in a simply supported beam of span 10 m carrying a uniformly distributed load of intensity 3.1 kN /m over the entire length. Take EI = $4x10^{13}$ N-mm^2 — 8 M

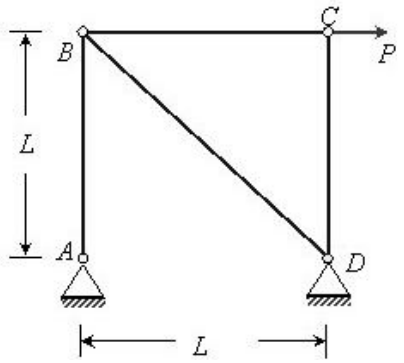
(OR)

8. a) State and prove Bettis reciprocal theorem — 4 M

   b) Determine the deflection in a Cantilever beam of length 'L' subjected to a uniformly distributed load of intensity 'w' kN/m from free end to center of span only? — 8 M

UNIT-V

9. Find the horizontal deflection at joint C of the pin-jointed frame as shown in Figure. AE is constant for all members. — 12 M



(OR)

10. Determine the forces in all the members of the truss shown in fig.1.Using Castigliano's theorem 1, the vertical displacement at joint C of the truss shown in fig. is proved to be δ = X/AE. Where A, E are Cross sectional area and young's modulus of each member. Find the value of X? — 12 M

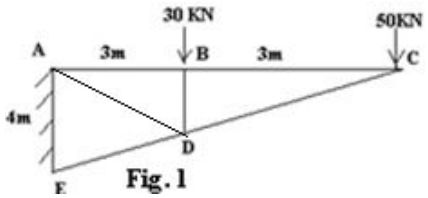


Fig. 1

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AR16

CODE: 16EE2012 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

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

ELECTRICAL MACHINES-II

(ELECTRICAL & 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.	a)	Derive an expression for maximum torque developed in a three-phase induction motor. And explain the torque –slip characteristics.	**7M**
	b)	A 3-phase, 4 pole, 50Hz induction motor has a rotor resistance of 0.1 ohm per phase and stand still reactance of 0.8 ohm per phase. If the full load slip is 5%. Determine the full load torque as a percentage of maximum torque. What should be the value of external rotor resistance per phase to give half of the maximum torque at starting.	**7M**

(OR)

2.	a)	Explain the principle of operation of a 3-phase induction motor. Explain why the rotor forced to rotate in the direction of rotating magnetic field.	**7M**
	b)	A 50 H.P., 3-phase, 4 pole, 50 Hz induction motor has full load efficiency of 85%. The friction and windage losses are one-third of the no-load losses and the full load rotor copper losses are equal to the iron losses. Find the full load speed. Neglect stator resistance.	**7M**

UNIT-II

3.	a)	Prove that the ratio of maximum torque to starting torque is $(1+a^2) / 2a$ where 'a' is the ratio of rotor resistance per phase to rotor stand still leakage reactance per phase.	**4M**
	b)	A 15 kW, 400V, 4 pole, 50Hz, 3-phase, star connected induction motor gave the following test results No load test: 400V, 9A, 1310W Blocked rotor test: 200V, 50A, 7100W Voltage and current are line values Stator and rotor ohmic losses at stand still are assumed equal. Draw the circle diagram. Hence, determine the maximum power input and maximum power output.	**10M**

(OR)

4.	a)	Describe briefly any two methods of speed control of 3-phase induction motor.	**7M**
	b)	Explain briefly about the different types of starting methods of 3-phase induction motor.	**7M**

UNIT-III

5.	a)	Derive EMF equation of alternator.	**10M**
	b)	Determine the frequency of a 12 pole alternator rotating at 600 R.P.M. If the no.of.poles is tripled, then what will be its new frequency?	**4M**

(OR)

6.	a)	Explain about the integral slot winding and fractional slot winding. Discuss their merits and demerits.	**7M**
	b)	An 8-pole alternator has an armature with 30 slots and 8 conductors per slot. The flux per pole is 0.08 Wb and machine rotates at 750 rpm. Calculate EMF generated, if winding factor is 0.94 and all conductors in a phase are connected in series	**7M**

UNIT-IV

7. a) Explain the merits and demerits of e.m.f and m.m.f methods. **7M**
   b) A 3phase star connected alternator is rated at 1600kVA, 13500 V. The armature effective resistance and synchronous reactance are 1.5 Ohm and 30 Ohm respectively per phase. Calculate the percentage regulation for a load of 1280 KW at power factor of 0.8 leading. **7M**

(OR)

8. a) Develop an expression for regulation of a salient pole synchronous generator. **7M**
   b) A 3-Phase, Star connected alternator is rated at 1600 KVA, 13500 V. The armature effective resistance and synchronous reactance are 2 ohms and 20 ohms respectively per phase. Calculate the percentage regulation for a load of 1200 kW at power factors of (i) 0.85 leading **7M**

UNIT-V

9. a) Explain the construction and principle of operation of a synchronous motor? **7M**
   b) A 400-V, 6-pole, 3-phase, 50 Hz, start connected synchronous motor has a it takes a current of 15 A at unity power factor when operating with a certain filed current. If the load torque is increases until the line current is 60 A, the filed current remaining unchanged. Find the gross torque development, and the new power factor. **7M**

(OR)

10. a) Explain the various starting methods of synchronous motor **7M**
    b) Explain the effects of varying excitation on armature current and power factor in a synchronous motor. Draw 'V' curves **7M**

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AR16

CODE: 16EC2012 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

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

RANDOM VARIABLES AND STOCHASTIC PROCESSES

(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. Given that P(A)=0.8, P(B)=0.6 and $P(A \cap B)$=0.5 then obtain (i) $P(A \cup B)$ (ii)$P(A \cap \bar{B})$ (iii)$P(\bar{A} \cap \bar{B})$(iv) $P(\bar{A} \cap B)$. **14M**

(OR)

2. a) Define probability,sample space,mutually exclusive events exhaustaive events with examples. **8M**

   b) Let two honest coins, marked 1 and 2, be tossed together. The four possible outcomes are *T*1*T*2, *T*1*H*2, *H*1*T*2, *H*1*H*2. (*T*1 indicates toss of coin 1 resulting in tails; similarly *T*2 etc.) We shall treat that all these outcomes are equally likely; that is the probability of occurrence of any of these four outcomes is 1/4. (Treating each of these outcomes as an event, we find that these events are mutually exclusive and exhaustive). Let the event *A* be 'not *H*1*H*2 ' and *B* be the event 'match'. (Match comprises the two outcomes *T*1*T*2, *H*1*H*2). Find *P* (*B*|*A*). Are *A* and *B* independent? **6M**

UNIT-II

3. A random variable X ha probabilities shown in a table. **14M**

x	-3	-2	-1	0	1	2
p(x)	0.2	0.5K	K	0.1	0.3K	K

(OR)

4. a) Find the mean and variance of a uniform density function. **8M**

$$f_x(x) = \begin{cases} \dfrac{1}{b-a} & a < x < b \\ 0 & \text{otherwise} \end{cases}$$

   b) The density function of a random variable is given as $f_x(x)=a\ c^{-bx}$ $x \geq 0$.Find the characteristic function and first two moments. **6M**

UNIT-III

5. The joint probability density function of the two random variables is **14M**

$$f(x,y) = \begin{cases} \frac{8}{9}xy\ ; 1 < x < y < 2 \\ 0\ \ ; elsewhere \end{cases}$$

   i) Obtain the marginal density functions of X and Y.
   ii) Obtain the conditional density function of Y given X and Y given X.

(OR)

6. a) Define joint characteristic function. Obtain the joint characteristic function of X and Y if **7M**

$$f_{X,Y}(x,y) = \frac{1}{2\pi} e^{-\left(\frac{x^2+y^2}{2}\right)}$$

b) Gaussian random variables X and Y have first and second order moments m_{10}=-1.1, m_{20}=1.16, m_{01}=1.5,m_{02}=2.89,R_{XY}=-1.724. Find C_{XY}, ρ? **7M**

UNIT-IV

7. a) A random process is given by x(t)=At, where A is an uniform distributed random variable on (0,2) find whether X(t) is WSS or not. **7M**

b) If $Y_1(t)=X_1 \cos\omega t+X_2 \sin \omega t$ **7M**

$Y_2(t)=X_1 \sin \omega t+X_2 \cos \omega t$

Where X_1 and X_2 are zero means independent random variables with unity variance. Show that the random processes $Y_1(t)$ and $Y_2(t)$ are individually WSS but not jointly WSS.

(OR)

8. a) Define autocorrelation function of a random process sand prove its properties**.** **7M**

b) Two WSS random process are defined by **7M**

$$X(t) = A\cos(\omega_0 t) + B\sin(\omega_0 t)$$

$$Y(t) = B\cos(\omega_0 t) - A\sin(\omega_0 t)$$

Where ω_0 is constant and A, B are uncorrelated zero mean random variables. Show that X(t) and Y(t) a jointly WSS.

UNIT-V

9. a) Derive the expression for cross power density spectrum of a random process **7M**

b) Determine the autocorrelation function of the random process with the power spectral density given by **7M**

$$S_{XX}(w) = \begin{cases} S_0 & |w| < w_0 \\ 0 & \text{otherwise} \end{cases}$$

(OR)

10. a) State and prove the properties of Power Spectral Density **7M**

b) Let $Y(t) = X(t) + N(t)$ be a wide-sense stationary process where $X(t)$ is the actual signal and $N(t)$ is a zero-mean noise process with variance σ^2 and independent of $X(t)$. Find the power spectral density of $Y(t)$. **7M**