		Course Code: B20ME3101			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B.Tech. I Semester MODEL QUESTION PAPER			
		DYNAMICS OF MACHINERY			
		Mechanical Engineering			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Discuss how a single revolving mass is balanced by two masses revolving in different planes	**1**	**2**	**7**
	b).	A shaft carries four masses in parallel planes A, B, C and D in this order along its length. The masses at B and C are 18 kg and 12.5 kg respectively, and each has an eccentricity of 60 mm. The masses at A and D have an eccentricity of 80 mm. The angle between the masses at B and C is 100° and that between the masses at B and A is 190°, both being measured in the same direction. The axial distance between the planes A and B is 100 mm and that between B and C is 200 mm. If the shaft is in complete dynamic balance, determine (i). The magnitude of the masses at A and D ; (ii). the distance between planes A and D ; and (iii). the angular position of the mass at D.	**1**	**3**	**7**
		OR			
2.	**a).**	Explain balancing of primary and secondary forces using direct and reverse cranks	**1**	**2**	**7**
	b).	An inside cylinder locomotive has its cylinder centre lines 0.7 m apart and has a stroke of 0.6 m. The rotating masses per cylinder are equivalent to 150 kg at the crank pin, and the reciprocating masses per cylinder to 180 kg. The wheel centre lines are 1.5 m apart. The cranks are at right angles. The whole of the rotating and 2/3 of the reciprocating masses are to be balanced by masses placed at a radius of 0.6 m. Find the magnitude and direction of the balancing masses. Calculate the fluctuation in rail pressure under one wheel and the magnitude of swaying couple at a crank speed of 300 r.p.m.	**1**	**3**	**7**
		UNIT-II			
3.	**a).**	Explain the gyroscopic couple effect on the motion of a Naval ship during pitching	**2**	**2**	**7**
	b).	An aero plane flying at 240 km/h turns towards the left and completes a quarter circle of 60 m radius. The mass of the rotary engine and	**2**	**3**	**7**

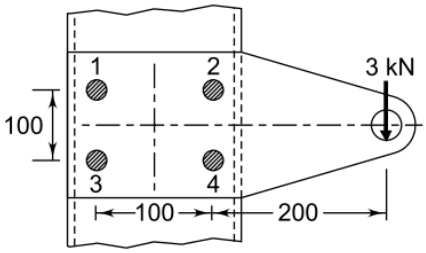
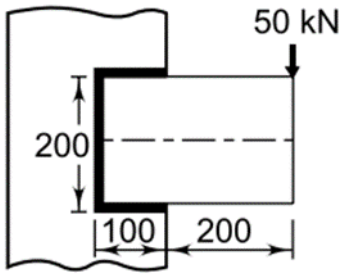
		propeller of the plane is 450 kg with a radius of gyration of 320 mm. The engine speed is 2000 rpm clockwise when viewed from the rear. Determine the gyroscopic couple on the aircraft and state its effect			
		OR			
4.	**a).**	Discuss the effect of the gyroscopic couple on a two wheeled vehicle when taking a turn	**2**	**2**	**7**
	b).	A rear engine automobile is travelling along a track of 100 m mean radius. Each of the four road wheels has a moment of inertia of 2.5 kg-m^2 and an effective diameter of 0.6 m. The rotating parts of the engine have a moment of inertia of 1.2 kg-m^2 . The engine axis is parallel to the rear axle and the crank shaft rotates in the same sense as the road wheels. The ratio of engine speed to back axle speed is 3:1. The automobile has a mass of 1600 kg and has its centre of gravity 0.5 m above road level. The width of the track of the vehicle is 1.5 m. Determine the limiting speed of the vehicle around the curve for all four wheels to maintain contact with the road surface. Assume that the road surface is not cambered and centre of gravity of the automobile lies centrally with respect to the four wheels.	**2**	**3**	**7**
		UNIT-III			
5.	**a).**	Establish an expression for the natural frequency of free longitudinal vibrations by Rayleghy's method	**3**	**3**	**7**
	b).	An instrument vibrates with a frequency of 1 Hz when there is no damping. When the damping is provided, the frequency of damped vibrations was observed to be 0.9 Hz. Calculate the damping factor	**3**	**3**	**7**
		OR			
6.	**a).**	Explain the term ‘whirling speed’ or ‘critical speed’ of a shaft. Prove that the whirling speed for a rotating shaft is the same as the frequency of natural transverse vibration	**3**	**2**	**7**
	b).	A shaft of length 0.75 m, supported freely at the ends, is carrying a body of mass 90 kg at 0.25 m from one end. Calculate the natural frequency of transverse vibration. Assume E = 200 GN/m2 and shaft diameter = 50 mm	**3**	**3**	**7**
		UNIT-IV			
7.	**a).**	Deduce an expression for the friction moment of a flat pivot assuming (i) Uniform pressure, and (ii) Uniform wear	**4**	**3**	**7**
	b).	The mean diameter of a square threaded screw jack is 50 mm. The pitch of the thread is 10 mm. The coefficient of friction is 0.15. What force must be applied at the end of a 0.7 m long lever, which is perpendicular to the longitudinal axis of the screw to raise a load of 20 kN and to lower it?	**4**	**3**	**7**

		OR			
8.	**a).**	What is a clutch? Make a sketch of a single -Plate clutch and describe its working	**4**	**2**	**7**
	b).	A multi-Plate disc clutch transmits 55kW of power at 1800 rpm. Coefficient of friction for the friction surface is 0.1. Axial intensity of pressure is not to exceed 160 kN/m^2. The internal radius is 80 mm and is 0.7 times the external radius. Calculate the number of plates needed to transmit the required torque	**4**	**3**	**7**
		UNIT-V			
9.	**a).**	Explain the terms 'fluctuation of energy' and 'fluctuation of speed' as applied to flywheels	**5**	**2**	**7**
	b).	The turning moment diagram for a multicylinder engine has been drawn to a scale 1 mm = 600 N-m vertically and 1 mm = 3° horizontally. The intercepted areas between the output torque curve and the mean resistance line, taken in order from one end, are as follows: + 52, – 124, + 92, – 140, + 85, – 72 and + 107 mm2, when the engine is running at a speed of 600 r.p.m. If the total fluctuation of speed is not to exceed ± 1.5% of the mean, find the necessary mass of the flywheel of radius 0.5 m.	**5**	**3**	**7**
		OR			
10.	**a).**	Explain the working of a Hartung governor with a neat sketch	**5**	**2**	**7**
	b).	The arms of a Porter governor are each 250 mm long and pivoted on then governor axis. The mass of each ball is 5 kg and the mass of the central sleeve is 30 kg. The radius of rotation of the balls is 150 mm when the sleeve begins to rise and reaches a value of 200 mm for maximum speed. Determine the speed range of the governor. If the friction at the sleeve is equivalent of 20 N of load at the sleeve, determine how the speed range is modified.	**5**	**3**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 14 marks

			Course Code: B20ME3102		
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B.Tech. I Semester MODEL QUESTION PAPER			
		DESIGN OF MACHINE ELEMENTS			
		Mechanical Engineering			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Explain the steps involved in machine design process	**1**	**3**	**7**
	b).	A shaft is transmitting 97.5kW at 180r.p.m. If the allowable shear stress in the material is 60 MPa, find the suitable diameter for the shaft. The shaft is not to twist more that 1° in a length of 3 meters. Take C = 80GPa.	**1**	**4**	**7**
		OR			
2.		The load on a bolt consists of an axial pull of 10kN together with a transverse shear force of 5kN. Find the diameter of bolt required according all the static failure theories.	**1**	**4**	**14**
		UNIT-II			
3.	**a).**	Explain about notch sensitivity	**2**	**3**	**4**
	b).	Determine the diameter of a circular rod made of ductile material with a fatigue strength (complete stress reversal), σ_e= 265 MPa and a tensile yield strength of 350 MPa. The member is subjected to a varying axial load from W_{min}= – 300 × 10^3N to W_{max}= 700 × 10^3N and has a stress concentration factor = 1.8. Use factor of safety as 2	**2**	**4**	**10**
		OR			
4.		A cold drawn steel rod of circular cross-section is subjected to a variable bending moment of 565 N-m to 1130 N-m as the axial load varies from 4500 N to 13500 N. The maximum bending moment occurs at the same instant that the axial load is maximum. Determine the required diameter of the rod for a factor of safety 2. Neglect any stress concentration and column effect. Assume the following values: Ultimate strength = 550 MPa Yield strength = 470 MPa Size factor = 0.85 Surface finish factor = 0.89 Correction factors = 1.0 for bending = 0.7 for axial loading	**2**	**4**	**14**

		UNIT-III			
5.		A steel plate subjected to a force of 3kN and fixed to a vertical channel by means of four identical bolts is shown in Fig. below. The bolts are made of plain carbon steel 45C8 (S_{yt}= 380 N/mm^2) and the factor of safety is 2. Determine the diameter of the shank. 	**3**	**4**	**14**
		OR			
6.		Design a cotter joint to connect two mild steel rods for a pull of 30kN. The maximum permissible stresses are 55MPa in tension; 40MPa in shear and 70MPa in crushing	**3**	**4**	**14**
		UNIT-IV			
7.		A welded connection of steel plates is shown in the Fig. below. It is subjected to an eccentric force of 50kN. Determine the size of the weld, if the permissible shear stress in the weld is not to exceed 70N/mm^2. 	**4**	**4**	**14**
		OR			
8.		A double riveted lap joint is made between 15 mm thick plates. The rivet diameter and pitch are 25 mm and 75 mm respectively. If the ultimate stresses are 400 MPa in tension,320 MPa in shear and 640 MPa in crushing, find the minimum force per pitch which will rupture the joint. If the above joint is subjected to a load such that the factor of safety is 4, find out the actual stresses developed in the plates and the rivets.	**4**	**4**	**14**
		UNIT-V			
9.		A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75mm. If the permissible shear stress is 350MPa and modulus of rigidity 84kN/mm^2, find the axial load which the spring can carry and the deflection per active turn by considering the effect of	**4**	**4**	**14**

		curvature and also neglecting the effect of curvature.			
		OR			
10.		A semi-elliptic leaf spring used for automobile suspension consists of three extra full-length leaves and 15 graduated-length leaves. The centre-to-centre distance between two eyes of the spring is 1m. The maximum force that can act on the spring is 75kN.For each leaf, the ratio of width to thickness is 9:1.The modulus of elasticity of the leaf material is207000 N/mm^2. The leaves are pre-stressed in such a way that when the force is maximum, the stresses induced in all leaves are same and equal to 450N/mm^2. Determine (i) the width and thickness of the leaves; (ii) the initial nip; and (iii) the initial pre-load required to close the gap C between extra full-length leaves andgraduated-length leaves.	**4**	**4**	**14**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 14 marks

			Course Code: B20ME3103		
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B.Tech. I Semester MODEL QUESTION PAPER			
		MECHANICAL MEASUREMENTS AND METROLOGY			
		Mechanical Engineering			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Explain static performance characteristics of an instrument in detail.	**1**	**2**	**7**
	b).	Illustrate any two torque measuring techniques with neat sketch?	**1**	**2**	**7**
		OR			
2.	**a).**	Briefly explain the force measurement with neat sketch.	**1**	**2**	**7**
	b).	Explain the construction and working principle of McLeod gauge.	**1**	**2**	**7**
		UNIT-II			
3.	**a).**	Write a detail note on 1) Sensitivity. 2) Calibration. 3) Precession. 4) Interchangeability.	**2**	**2**	**7**
	b).	Explain construction and working of Optical comparator with a neat sketch.	**2**	**2**	**7**
		OR			
4.	**a).**	Describe Taylor's principle of Gauge Design with neat sketch.	**2**	**2**	**7**
	b).	Define fit, and classify the types of fits in brief.	**2**	**2**	**7**
		UNIT-III			
5.	**a).**	Explain measurement of gear tooth thickness with a neat sketch.	**3**	**2**	**7**
	b).	Explain measurement of effective diameter of a screw thread with neat sketch.	**3**	**2**	**7**
		OR			
6.	**a).**	Explain the construction and working of an Autocollimator.	**3**	**2**	**7**
	b).	Illustrate construction and working of a Tool maker's microscope.	**3**	**2**	**7**
		UNIT-IV			
7.	**a).**	Explain the acceptance tests to be performed on a lathe.	**4**	**2**	**7**
	b).	Explain various factors effecting surface roughness.	**4**	**2**	**7**
		OR			

8.	**a).**	With the help of a neat sketch explain any one surface roughness measuring instrument.	**4**	**2**	**7**
	b).	Explain any two alignment tests performed on milling machine with neat sketch.	**4**	**2**	**7**
		UNIT-V			
9.	**a).**	Define optical fibers. Explain its classifications and properties.	**5**	**2**	**7**
	b).	Briefly explain length/displacement measurement with help of a neat sketch.	**5**	**2**	**7**
		OR			
10.	**a).**	Explain fiber optic sensor configuration with a neat sketch.	**5**	**2**	**7**
	b).	Explain any one vibration measurement technique with a neat sketch.	**5**	**2**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 14 marks

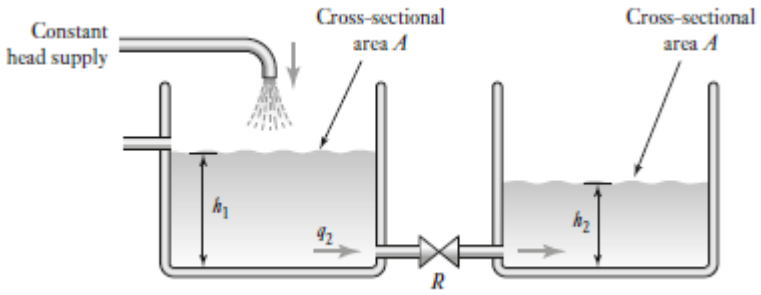
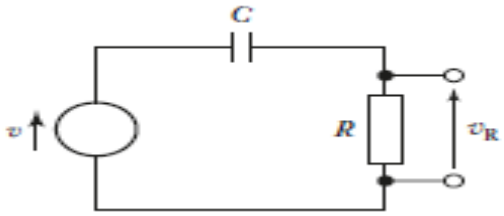
			Course Code: B20ME3104		
SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)					**R20**
III B.Tech. I Semester MODEL QUESTION PAPER					
COMPOSITE MATERIALS					
Mechanical Engineering					
Time: 3 Hrs.				**Max. Marks: 70 M**	
Answer **ONE Question** from **EACH UNIT**					
All questions carry equal marks					
Assume suitable data if necessary					
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Classify the Composite materials with a neat sketch	**1**	**2**	**7**
	b).	Briefly explain the functional requirements of reinforcement	**1**	**2**	**7**
		OR			
2.	**a).**	Discuss the advantages and limitations of composite materials over conventional materials.	**1**	**2**	**7**
	b).	Briefly discuss the types of continuous and discontinuous reinforcements.	**1**	**2**	**7**
		UNIT-II			
3.	**a).**	Discuss the processing and properties of Glass fibers with a neat sketch.	**2**	**2**	**7**
	b).	Briefly discuss the Polymer Matrix materials and their properties	**2**	**2**	**7**
		OR			
4.	**a).**	Illustrate the method for fabricating the carbon fibers	**2**	**2**	**7**
	b).	Explain the ceramic Matrix materials and their properties	**2**	**2**	**7**
		UNIT-III			
5.	**a).**	With a neat sketch explain the Wet/Hand layup method	**3**	**2**	**7**
	b).	Explain the Preparation of Molding compounds of Polymer matrix composites	**3**	**2**	**7**
		OR			
6.	**a).**	Explain the process of Resin Transfer Molding with a neat sketch	**3**	**2**	**7**
	b).	Explain the Film Stacking and Diaphragm Forming process for manufacturing the C-C composites	**3**	**2**	**7**
		UNIT-IV			
7.	**a).**	Illustrate the pressure infiltration process for manufacturing metal matrix composites	**4**	**2**	**7**

	b).	Discuss the Liquid phase sintering process for metal matrix composites with a neat sketch	**4**	**2**	**7**
		OR			
8.	**a).**	Discuss the following methods for manufacturing c-c composites (a) Impregnation carbonization Process (b) Pyrolysis Process	**4**	**2**	**7**
	b).	Describe the process of Hot isostatic pressing for metal matrix composites	**4**	**2**	**7**
		UNIT-V			
9.	**a).**	Derive the equation for Youngs Modulus of Composite under Iso-Stress condition	**5**	**3**	**7**
	b).	Find the compliance and stiffness matrix for a graphite/epoxy lamina. The material properties are given as E1 = 181GPa,E2 = 10.3GPa, E3 = 10.3GPa, ν12 = 0.28, ν23 = 0.60 ν13 = 0.27, G12 = 7.17GPa, G23 = 3.0GPa,G31 = 7.00GPa	**5**	**3**	**7**
		OR			
10.	**a).**	A thermoplastic matrix contains 40 wt.% glass fiber. If the density of the matrix is 1.1 g/cm3 while that of glass fiber is 2.5 g/cm3, what is the density of the composite? Assume that no voids are present.	**5**	**3**	**7**
	b).	Show that there are 13 constants for monoclinic materials in stress-strain relations	**5**	**3**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

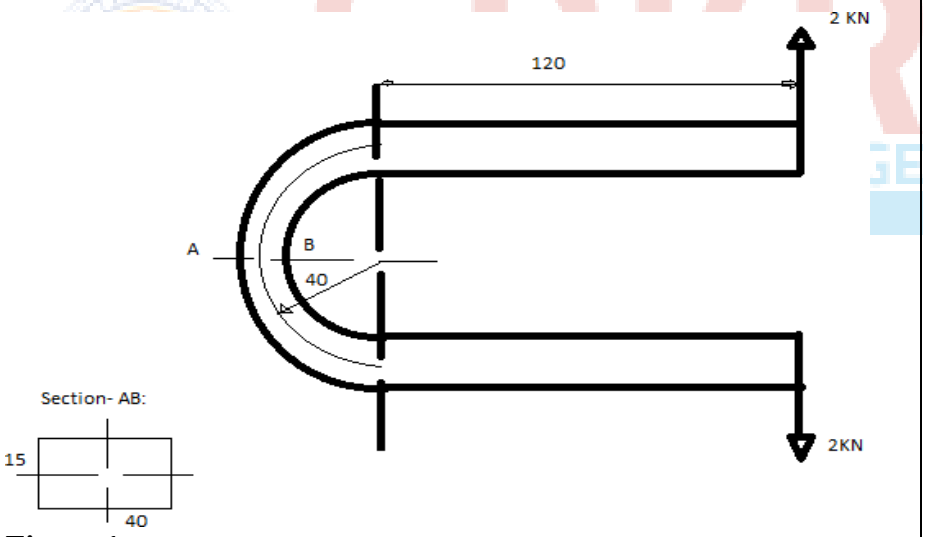
NOTE : Questions can be given as A,B splits or as a single Question for 14 marks

		Course Code: B20ME3105			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B.Tech. I Semester MODEL QUESTION PAPER			
		MECHATRONICS			
		Mechanical Engineering			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	What do you understand by the term Mechatronics? With a neat diagram, show the basic elements of a Mechatronic system. Give examples of Mechatronic systems.	**1**	**2**	**7**
	b).	Write short notes on i) proximity sensor and ii) hall effect sensor	**1**	**2**	**7**
		OR			
2.	**a).**	Explain optical encoder and strain gauges.	**1**	**2**	**7**
	b).	Discuss integrating and differentiating amplifier.	**1**	**2**	**7**
		UNIT-II			
3.	**a).**	What is direction control valve? Explain the operation of single solenoid valve.	**2**	**2**	**7**
	b).	What do you understand by the term Actuation system? With a neat schematic diagram, describe the construction and working of a Hydraulic system.	**2**	**2**	**7**
		OR			
4.	**a).**	Explain digital to analog and analog to digital converters.	**2**	**2**	**7**
	b).	Draw ladder logic diagram of OR, NOR, and XOR logic.	**2**	**2**	**7**
		UNIT-III			
5.	**a).**	What is the use of a mechanical switch? How does an electrical relay operate? Draw the relay drive circuit and explain its operation.	**3**	**3**	**7**
	b).	Write the working principle of stepper motor.	**3**	**3**	**7**
		OR			
6.	**a).**	Derive the relationship between the height $h2$ and time for the hydraulic system shown in Figure 1. Neglect inertance.	**3**	**3**	**7**

		 Figure 1			
	b).	Derive the relationship between the output, the potential difference across the resistor R of vR, and the input v for the circuit shown in Figure 2 which has a resistor in series with a capacitor.  Figure 2	**3**	**3**	**7**
		UNIT-IV			
7.	**a).**	A first-order system has a time constant of 4 s and a steady-state transfer function of 6. What is the form of the differential equation for this system?	**4**	**3**	**7**
	b).	What is the overall transfer function for a closed-loop system having a forward-path transfer function of 5/ (s+3) and a negative feedback-path transfer function of 10?	**4**	**3**	**7**
		OR			
8.	**a).**	Explain the closed loop control system using a block diagram.	**4**	**3**	**7**
	b).	Explain PD and PID control.	**4**	**3**	**7**
		UNIT-V			
9.	**a).**	Describe basic elements of microprocessor based control system.	**5**	**3**	**7**
	b).	Lists out differences between microprocessor and microcontroller.	**5**	**3**	**7**
		OR			
10.	**a).**	Define PLC. Sketch and explain the basic functions of PLC.	**5**	**3**	**7**
	b).	What is an industrial robot? With the help of a block diagram describe different components of a robotic system.	**5**	**3**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 14 marks

		Course Code: B20ME3106			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B.Tech. I Semester MODEL QUESTION PAPER			
		ADVANCED STRENGTH OF MATERIALS			
		Mechanical Engineering			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.		Obtain an expression for circumferential stress induced in a curved bar subjected to uniform bending moment.	**1**	**3**	**14**
		(OR)			
2.		Find maximum and minimum stresses at the most stressed section of the frame shown in Figure 1, hence draw the resultant stress distribution.  **Figure 1**	**1**	**4**	**14**
		UNIT-II			
3.		Draw BMD and SFD for a fixed beam of length 4 m and subjected to a UDL of 3 KN /m run throughout its length and a concentrated load of 10 KN at its mid span. Locate the points of contra flexure, if any.	**2**	**3**	**14**
		(OR)			
4.	**a).**	Derive the relations between fixing moments of a fixed beam.	**2**	**3**	**7**
	b).	A beam of span 4 m fixed at A and B carries a UDL of 1500 N/m. The support B sinks by 1mm. Find the fixed end moments and draw	**2**	**3**	**7**

		the BMD for the beam. Take E = 2 X 10^5 N / mm^2, I = 8000cm^4.			
		UNIT-III			
5.		Derive Clapeyron's theorem of 3 moments applied to a continuous beam of uniform cross section.	**3**	**3**	**14**
		(OR)			
6.		A continuous beam ABCD covers three spans, AB = 6m, BC = 12m, CD = 4m. It carries UDLs of 2 KN, 1 KN and 3 KN per meter run on AB, BC and CD respectively. If the beam is of same cross section throughout, find the bending moments at the supports B and C and the pressure on each support. Plot the BMD and SFD.	**3**	**3**	**14**
		UNIT-IV			
7.	**a).**	Derive Euler's buckling load formula for a column having both ends fixed.	**4**	**3**	**7**
	b).	Determine the crippling load for a T–section of dimensions 10 cm × 10 cm × 2 cm and length 5 m, when it is used as a strut with both ends fixed. Take E = 2 X 10^5 N/mm^2.	**4**	**3**	**7**
		(OR)			
8.		A hollow cylindrical C.I. column is 4m long with both ends fixed. Determine the internal diameter of the column if it has to carry a safe load of 250 KN with a factor of safety of 5. Take the ID as 0.8 times the E.D, σ_c= 550 N / mm^2 and α = 1/1600 in Rankine's formula.	**4**	**3**	**14**
		UNIT-V			
9.		A steel disc of uniform thickness and having diameter of 900 mm is rotating at 2400 rpm about its axis. Determine the radial and circumferential stresses at the center and at the outer surface. If the disc is having a central hole of 200 mm diameter, find the radial and circumferential stresses at inner and outer surfaces of the disc. Take: ρ = 7800 kg /m^3 and μ = 0.3.	**5**	**3**	**14**
		(OR)			
10.		Derive an expression for thickness of a rotating disc of uniform strength.	**5**	**3**	**14**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 14 marks

		Course Code: B20ME3201			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B.Tech. II Semester MODEL QUESTION PAPER			
		CAD/CAM			
		Mechanical Engineering			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	What is product life cycle? Explain CAD/CAD overlaid product cycle.	**1**	**2**	**7**
	b).	Write short notes on creating manufacturing database.	**1**	**2**	**7**
		OR			
2.	**a).**	What are the types of system configuration? Write in brief.	**1**	**2**	**7**
	b).	What are benefits of implementing CAD?	**1**	**2**	**7**
		UNIT-II			
3.	**a).**	A rectangle formed by the four points whose co-ordinates are A (50, 50), B (100, 50), C (100, 80), D (50, 80). Calculate the new co-ordinates (i) when the rectangle is reduced in size using the scaling factor Sx = 0.5, Sy = 0.6. (ii) When the lamina is rotated about origin through 30^0 in the counter clock wise direction. (iii) When the rectangle is translated 3 units in x-direction and 2 units in y-direction.	**2**	**3**	**7**
	b).	Explain about the importance of various graphics standards.	**2**	**2**	**7**
		OR			
4.		Explain about various geometric modeling techniques using examples.	**2**	**2**	**14**
		UNIT-III			
5.	**a).**	What are the steps to be carried out for solving a physical problem with the help of a FEM software?	**3**	**3**	**7**
	b).	Discuss the CAD applications of FEM in detail.	**3**	**2**	**7**
		OR			
6.	**a).**	How AI is useful in computer aided design? Explain in detail.	**3**	**2**	**7**
	b).	Discuss the structure of an expert system.	**3**	**2**	**7**
		UNIT-IV			

7.	**a).**	Write comparison between the NC, CNC, and DNC systems.	**4**	**2**	**7**
	b).	Explain about the Opitz coding system.	**4**	**2**	**7**
		OR			
8.	**a).**	Explain the different types of CAPP systems used in process planning.	**4**	**2**	**7**
	b).	Explain about the Computer Aided process planning-its advantages and applications.	**4**	**2**	**7**
		UNIT-V			
9.	**a).**	Explain about the robot configurations in detail.	**5**	**2**	**7**
	b).	Discuss about the CMM machine and its types.	**5**	**2**	**7**
		OR			
10.	**a).**	Discuss about the other optical inspection techniques.	**5**	**2**	**7**
	b).	Discuss about the other non-optical inspection methods.	**5**	**2**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 14 marks

		Course Code: B20ME3202			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B.Tech. II Semester MODEL QUESTION PAPER			
		HEAT TRANSFER			
		Mechanical Engineering			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Explain the different modes of heat transfer with neat sketches. Write down the basic laws of heat transfer	**1**	**2**	**7**
	b).	A wire of 6mm diameter with 2mm thick insulation (k=0.11w/m-k). If the convective heat transfer coefficient between the insulating surface and air is 25w/m^2k. Analyse the critical thickness of insulation and also find the percentage of change in the heat transfer rate if the critical radius is used.	**1**	**3**	**7**
		OR			
2.	**a).**	Explain an expression for Conduction of Heat through hollow sphere.	**1**	**2**	**7**
	b).	A composite insulating wall has three layer of material held together by 4cm diameter aluminum (K=200w/m-k) rivet per 0.1 m^2 of surface. The layer of materials consists of 12cm thick brick (k= 0.90 w/m-k) with hot surface at 220°C, 22cm thick timber (k=0.110 w/m-k) with cold surface at 15°C. These two layers are interposed by third layer of insulating material 1.5cm thick of conductivity 0.170w/mk. Analyze the percentage of increase in heat transfer rate due to rivet.	**1**	**3**	**7**
		UNIT-II			
3.	**a).**	Explain about the Fin efficiency and Fin effectiveness.	**1**	**2**	**7**
	b).	A very long 1cm diameter copper rod k=377W/m-K is exposed to an environment at 22^0C. The base temperature of the rod is maintained at 150^0C.The heat transfer coefficient between the rod and the surrounding air is 11W/m^2K.Estimate the heat transfer rate from the rod to the surrounding air.	**1**	**3**	**7**
		OR			
4.	**a).**	Explain the Biot and Fourier's numbers and their significance.	**1**	**2**	**7**
	b).	A large steel plate 5cm thick is initially at a uniform temperature of 400^0C. It is suddenly exposed on both sides to a surrounding at 60^0C with convective heat transfer co-efficient of 285W/m^2K. Calculate	**1**	**3**	**7**

		the center line temperature and the temperature inside the plate 1.25cm from themed plane after 3 minutes.			
		UNIT-III			
5.	**a).**	Classify the advantages and limitations of dimensional analysis.	**2**	**3**	**7**
	b).	Air at 20^0C at atmospheric pressure flows over a flat plate at a velocity of 3m/s. If the plate is 1m wide and 80^0C, Solve the following at x = 300mm. 1. Hydrodynamic boundary layer thickness, 2. Thermal boundary layer thickness, 3. Local friction coefficient, 4. Average friction coefficient, 5. Local heat transfer coefficient, 6. Average heat transfer coefficient, 7. Heat transfer.	**2**	**3**	**7**
		OR			
6.	**a).**	Explain the temperature and velocity profiles in free convection on a vertical wall.	**2**	**2**	**7**
	b).	Solve the coefficient of heat transfer by free convection between a horizontal wire and air at 25°C. The surface of the wire is at 95°C and if diameter is 2.5mm. Also find the maximum admissible current intensity if the resistance of the wire is 6 ohm/m.	**2**	**3**	**7**
		UNIT-IV			
7.	**a).**	Categorize brief note on heat transfer during boiling and Condensation.	**3**	**3**	**7**
	b).	A 4 cm OD, 1m long tube is to be used to condense steam at atmospheric pressure. The water flows inside the tube maintaining the wall surface at 60^0C. Inspect the mass of condensate for the tube in (i) Horizontal position and (ii) Vertical position.	**3**	**4**	**7**
		OR			
8.	**a).**	Compare the advantages of NTU method over the LMTD method of heat exchanger design.	**3**	**3**	**7**
	b).	Hot coil having a specific heat of 2.09kJ/kg-K flows through a counter flow heat exchanger at the rate of 2268kg/h with an inlet temperature of 93^0C and an outlet temperature of 65^0C. Cold oil having a specific heat of 1.67kJ/kg-K flows in at a rate of 3600kg/h and leaves at 149^0C. Examine the area is required to handle this load, if the overall heat transfer coefficient based on the inside area is 0.7 kW/m^2K.	**3**	**4**	**7**
		UNIT-V			

9.	**a).**	Explain the Fick's first law of diffusion.	**4**	**2**	**7**
	b).	Two parallel plates of size 1.0m x 1.0m spaced 0.5m apart are; ocated in very large room , the walls are maintained at a temperature of 27^0C one plate is maintained at a temperature of 900^0C and other at 400^0C their emissivity are 0.2 and 0.5 respectively. If the plate exchange heat themselves and surroundings. Solve the heat transfer to each plate and to them. Consider only the plate surface facing each other.	**4**	**3**	**7**
		OR			
10.	**a).**	Explain the brief the concept of a black body.	**4**	**2**	**7**
	b).	A 60 mm thick plate with a circular hole of 30 mm diameter along the thickness is maintained at uniform temperature of 300^0C. Solve the loss of energy to the surroundings at 20^0C, assuming that the two ends of the hole to be as parallel discs and the metallic surfaces and surroundings have black body characteristics.	**4**	**3**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 14 marks

			Course Code: B20ME3203		
SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)					**R20**
III B.Tech. II Semester MODEL QUESTION PAPER					
INDUSTRIAL ENGINEERING AND MANAGEMENT					
Mechanical Engineering					
Time: 3 Hrs.			**Max. Marks: 70 M**		
Answer **ONE Question** from **EACH UNIT**					
All questions carry equal marks					
Assume suitable data if necessary					
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Explain Henry Fayol's principles of management in brief.	**1**	**3**	**7**
	b).	Classify and explain the types of Organization.	**1**	**2**	**7**
		OR			
2.	**a).**	Discuss any three theories of Motivation.	**1**	**2**	**7**
	b).	Explain the industrial dispute Act 1947.	**1**	**2**	**7**
		UNIT-II			
3.	**a).**	Elaborate the different types of production.	**2**	**3**	**7**
	b).	Explain briefly about product design and development.	**2**	**2**	**7**
		OR			
4.	**a).**	Articulate Loading and scheduling	**2**	**3**	**7**
	b).	What is Forecasting? What are different forecasting techniques? Explain	**2**	**2**	**7**
		UNIT-III			
5.	**a).**	Summarize the factors affecting location of plant layout.	**3**	**2**	**7**
	b).	Enunciate the different types of plant layout.	**3**	**3**	**7**
		OR			
6.	**a).**	Articulate the principles of Material handling and concept of Unit Load, Containerization.	**3**	**3**	**7**
	b).	Explain any three types of Material handling equipment and their industrial applications.	**3**	**2**	**7**
		UNIT-IV			
7.	**a).**	Demonstrate the basic steps involved in Method Study.	**4**	**2**	**7**
	b).	Prepare the principles of Motion Economy in brief.	**4**	**3**	**7**
		OR			
8.	**a).**	Explain (i) SIMO Chart (ii) Therbligs (iii) Process Charts	**4**	**2**	**7**
	b).	Explain Work Measurement Techniques	**4**	**3**	**7**

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<tr><td></td><td></td><td>UNIT-V</td><td></td><td></td><td></td></tr>
<tr><td>9.</td><td>a).</td><td>Enumerate the objectives and steps involved in Purchasing Department</td><td>5</td><td>3</td><td>7</td></tr>
<tr><td></td><td>b).</td><td>Determine the E.O.Q and calculate how frequently orders be placed. An aircraft company uses a certain part at a constant rate of 2000 units per year. Each unit costs Rs.25 and the company personnel estimate that it costs Rs 120 to place an order and carrying cost of inventory is 15% per year.</td><td>5</td><td>4</td><td>7</td></tr>
<tr><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td>10.</td><td>a).</td><td>Summarize Single and Double Sampling Plans with neat schematics.</td><td>5</td><td>2</td><td>7</td></tr>
<tr><td></td><td>b)</td><td>Draw p-chart and complete with a conclusion from the chart The below given table is a given result of inspection of 20 samples of 100 items each
<table>
<tr><td>Sample no</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>No. of defectives</td><td>0</td><td>2</td><td>4</td><td>6</td><td>6</td><td>4</td><td>0</td><td>2</td><td>4</td><td>8</td></tr>
<tr><td>Sample no</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr>
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taken on 20 working days</td><td>5</td><td>4</td><td>7</td></tr>
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CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 14 marks

		Course Code: B20ME3204			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B.Tech. II Semester MODEL QUESTION PAPER			
		REFRIGERATION AND AIR CONDITIONING			
		Mechanical Engineering			
Time: 3 Hrs.				**Max. Marks: 70 M**	
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Explain working of Bell-Coleman refrigeration system with the help of T-S diagram.	**1**	**2**	**7**
	b).	Compare open and dense air refrigeration. What is the necessity of Air craft refrigeration?	**1**	**2**	**7**
		OR			
2.	**a).**	A refrigerator working on Bell – Coleman cycle operates between pressure limits of 1.05 bar and 8.5 bar. Air is drawn from the cold chamber at 10°C .Air coming out of compressor is cooled to 30°C before entering the expansion cylinder. Expansion and compression follow the law $pv^{1.35}$ = constant. Determine theoretical COP.	**1**	**3**	**7**
	b).	Explain working of Bootstrap refrigeration with the help of a neat sketch.	**1**	**2**	**7**
		UNIT-II			
3.	**a).**	Explain the working of a simple saturated vapour compression refrigeration system with the help of a schematic diagram.	**2**	**2**	**7**
	b).	Examine the effect of sub cooling and superheating on the performance of a vapour compression refrigeration cycle? Explain with the help of p-v and T-S diagrams	**2**	**3**	**7**
		OR			
4.	**a).**	Discuss the classification of refrigerants.	**3**	**2**	**7**
	b).	What is a secondary refrigerant? What are the it's desirable characteristics?	**3**	**1**	**7**
		UNIT-III			
5.	**a).**	With a neat sketch, explain the working principle of two fluid vapour absorption refrigeration system	**4**	**3**	**7**
	b).	List the advantages and disadvantages of Electrolux refrigerator over conventional refrigerators.	**4**	**2**	**7**

		OR			
6.	**a).**	Explain the Working of Steam jet refrigeration system with a neat sketch.	**4**	**3**	**7**
	b).	Explain Thermo electric Refrigeration system.	**4**	**3**	**7**
		UNIT-IV			
7.	**a).**	Make use of Psychometric diagram ,explain i) Sensible Cooling and ii) Heating and humidification.	**5**	**3**	**6**
	b).	400 m^3/min of re circulated at 20℃ DBT and 10℃ DPT is to be mixed with 150 m^3/min of fresh air at 35℃ DBT and 45% RH. Determine the enthalpy, specific volume, humidity ratio and dew point temperature of the mixture.	**5**	**3**	**8**
		OR			
8.	**a).**	In an air-conditioning system, the inside and outside conditions are dry bulb temperature 25℃,relative humidity 50% and dry bulb temperature 40℃, wet bulb temperature 27℃ respectively. The room sensible heat factor is 0.8. 50% of the room air is rejected to atmosphere and an equal quantity of fresh air added before air enters the air conditioning apparatus. If the fresh air added is 100m^3/min, determine: 1.Room sensible and latent heat load; 2.Sensible and latent heat load due to fresh air; 3.Apparatus dew point; 4. Humidity ratio and dry bulb temperature of air entering air conditioning apparatus. Assume by-pass factor as zero, density of air as 1.2kg/m^3 at a total pressure of 1.01325 bar.	**5**	**4**	**8**
	b).	What is an effective temperature? State and explain the factors which govern optimum effective temperature?	**5**	**3**	**6**
		UNIT-V			
9.	**a).**	Explain about winter and summer air conditioning.	**5**	**3**	**7**
	b).	What are the advantages and disadvantages of spray type dehumidifier over coil type dehumidifier?	**5**	**2**	**7**
		OR			
10.	**a).**	What are the different loads to be considered to estimate the total cooling load in the design of air conditioning systems? Discuss in detail each of these loads.	**5**	**5**	**7**
	b).	Explain about i) RSHF ii) GSHF	**5**	**4**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 14 marks

		Course Code: B20ME3205			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B.Tech. II Semester MODEL QUESTION PAPER			
		DESIGN OF TRANSMISSION ELEMENTS			
		Mechanical Engineering			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.		A pair of carefully cut straight teeth spur gears, having 20° involute full depth teeth is to transmit 12kW at 300r.p.m. of the pinion. The speed ratio is 3:1. The allowable static stresses for gear of cast iron and pinion of steel are 60MPa and 105MPa respectively. Assume the following: Number of teeth of pinion = 16; Face width = 14 times module; Determine the module, face width and pitch diameter of gears. Check the gears for wear; given σ_{es} = 600 MPa; E_P= 200kN/mm^{2}and E_G= 100kN/mm^2	**1**	**4**	**14**
		OR			
2.		A pair of cast iron bevel gears connect two shafts at right angles. The pitch diameters of the pinion and gear are 80 mm and 100 mm respectively. The tooth profiles of the gears are of 14 & 1/2º composite form. The allowable static stress for both the gears is 55 MPa. If the pinion transmits 2.75kW at 1100 r.p.m., find the module and number of teeth on each gear from the standpoint of strength and check the design from the standpoint of wear. Take surface endurance limit as 630MPa and modulus of elasticity for cast iron as 84kN/mm^2.	**1**	**4**	**14**
		UNIT-II			
3.		The cylinder of a four-stroke diesel engine has the following specifications: Brake power = 7.5kW, Speed = 1400rpm, Indicated mean effective pressure = 0.35MPa, Mechanical efficiency = 80%, Maximum gas pressure = 3.5MPa. The cylinder liner and head are made of grey cast iron FG 260 (S_{ut}= 260 N/mm^2 and μ = 0.25). The studs are made of plain-carbon steel 40C8 (S_{yt}=380 N/mm^2). The factor of safety for all parts is 6..	**2**	**4**	**14**
		OR			
4.		Design a cast iron piston for a single acting four-stroke diesel engine with the following data: Cylinder bore = 300mm, Length of stroke = 450mm, Speed = 300rpm, Indicated mean effective pressure =	**2**	**4**	**14**

		0.85MPa, Maximum gas pressure = 5MPa, Fuel consumption = 0.30 kg per BP per hr, Higher calorific value of fuel = 44000kJ/kg.			
		UNIT-III			
5.		Design a journal bearing for a centrifugal pump from the following data. Load on the journal = 20000N; Speed of the journal = 900r.p.m.; Type of oil is SAE 10, for which the absolute viscosity at 55°C = 0.017 kg/m-s; Ambient temperature of oil = 15.5°C; Maximum bearing pressure for the pump = 1.5N/mm^2.Calculate also mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited to 10°C.	**3**	**4**	**14**
		OR			
6.	**a)**	Classify bearings based on lubricant	**3**	**3**	**4**
	b)	A shaft rotating at constant speed is subjected to variable load. The bearings supporting the shaft are subjected to stationary equivalent radial load of 3kN for 10% of time, 2kN for 20% of time, 1kN for 30% of time and no load for remaining time of cycle. If the total life expected for the bearing is 20 × 10^6 revolutions at 95% reliability, calculate dynamic load rating of the ball bearing	**3**	**4**	**10**
		UNIT-IV			
7.		A steel solid shaft transmitting 15kW at 200r.p.m. is supported on two bearings 750mm apart and has two gears keyed to it. The pinion having 30 teeth of 5mm module is located 100mm to the left of the right hand bearing and delivers power horizontally to the right. The gear having 100 teeth of 5mm module is located 150mm to the right of the left hand bearing and receives power in a vertical direction from below. Using an allowable stress of 54MPa in shear, determine the diameter of the shaft.	**4**	**4**	**14**
		OR			
8.		Design a protective type of cast iron flange coupling for a steel shaft transmitting 15kW at 200r.p.m. and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30MPa. Assume that the same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 25% greater than the full load torque. The shear stress for cast iron is 14MPa..	**4**	**4**	**14**
		UNIT-V			
9.		Select a suitable wire rope to lift a load of 10 kN of debris from a well 60 m deep. The rope should have a factor of safety equal to 6. The load is lifted up with a maximum speed of 150metres/min which	**5**	**4**	**14**

		is attained in 1 second.			
		OR			
10.		Design a chain drive to connect a 15kW, 1400 rpm electric motor to a transmission shaft running at 350 rpm. The operation involves moderate shock.	**5**	**4**	**14**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 14 marks

		Course Code: B20ME3206			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B.Tech. II Semester MODEL QUESTION PAPER			
		OPTIMIZATION TECHNIQUES			
		Mechanical Engineering			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.		Minimize: $3x_1^2+4x_2^2+5x_3^2$ such that $x_1+x_2+x_3 = 10$ using Lagrange"s multiplier method.	**1**	**3**	**14**
		OR			
2.		State the optimization problem. Classify and explain various types of optimization problems with examples.	**1**	**2**	**14**
		UNIT-II			
3.		Find the value of x in the interval (1,5) which minimizes the function *f* = x^2 + 54 / x by (a) Dichotomous search method, and (b) Golden section method.	**2**	**3**	**14**
		OR			
4.		Find the minimum of the function f = $\lambda^5 - 5\lambda^3 - 20\lambda + 5$using Fibonacci search method in the interval (0,5).	**2**	**3**	**14**
		UNIT-III			
5.		Minimize: f (x1, x2) = 2 x_1^2 + $x_2^2$by using steepest descent method with the starting point (1, 2). Use two iterations.	**2**	**3**	**14**
		OR			
6.		Minimize: f = x_1 - x_2 + $2x_1x_2$ + $2x_1^2$ + x_2^2 using Nelder-Mead"s Simplex method. Take the points defining the initial Simplex as: $\mathbf{X_1} = \begin{Bmatrix}4.0\\4.0\end{Bmatrix}$, $\mathbf{X_2} = \begin{Bmatrix}5.0\\4.0\end{Bmatrix}$, $\mathbf{X_3} = \begin{Bmatrix}4.0\\5.0\end{Bmatrix}$ and $\alpha = 1.0$, $\beta = 0.5$, $\gamma = 2.0$.	**2**	**3**	**14**
		UNIT-IV			
7.	**(a)**	(a) Explain the working principle of Genetic Algorithm.	**3**	**2**	**7**
	(b)	What are the drawbacks of GA?	**3**	**2**	**7**
		OR			
8.		Explain the reproduction, crossover and mutation.	**3**	**3**	**14**

		UNIT-V			
9.		A company manufactures two products, radios and transistors, which must be processed through assembly and finishing departments. Assembly has 90 hours available and finishing can handle up to 72 hours of work. Manufacturing one radio requires 6 hours in assembly and 3 hours in finishing. While manufacturing one transistor requires 3 hours in assembly and 6 hours in finishing. If profit is Rs. 120 per radio and Rs. 90 per transistor, determine the best combination of radios and transistors to realize a maximum profit of Rs. 2100/-. Solve by goal programming method.	**4**	**3**	**14**
		OR			
10.		Explain the Lexicographic method and Goal Programming method.	**4**	**2**	**14**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 14 marks