

MODERN MANUFACTURING METHODS
(Mechanical Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 Classify modern machining processes on the basis of the type of energy employed. Also, state the mechanism of material removal, transfer media, and energy sources used.
- 2 Discuss the hypothesis proposed by Shaw regarding the mode of material removal in ultrasonic machining and obtain an expression for machining rate. What are the assumptions on which this expression is based? How far these assumptions valid?
- 3
 - (a) Discuss the effects of any five important parameters on working accuracy and rate of material removal of AJM process. Draw a sketch showing the effect of one of these variables on MRR.
 - (b) 'AJM is not recommended to machine ductile materials'. Comment.
 - (c) Diameter of the nozzle is 1.0 mm and jet velocity is 250 m/s. Find the volumetric flow rate (cm^3/s) of the carrier gas and abrasive mixture.
- 4
 - (a) Discuss the advantages of ECM as compared to other non traditional methods with regard to: (i) metal removal rate, (ii) accuracy, and (iii) surface finish.
 - (b) Give the practical applications and limitations of ECM.
 - (c) During machining of iron (atomic weight = 55.85, valency = 2, density = 7.85 g/cm^3), the equilibrium gap is approximately 0.125 mm and the measured value of specific conductance of electrolyte = $0.2 \Omega^{-1} \text{ cm}^{-1}$. Faraday's constant is 26.8 Ah, applied voltage is 10 V, and overvoltage is 1.5 V. Calculate the value of feed rate.
- 5
 - (a) In an EDM with R-C circuit, the supply voltage is 100 V and the break-down voltage corresponds to maximum power delivery conditions. If the supply voltage is increased to 125 V without alter in any of the other electrical parameters of the circuit, what is the percentage increase in metal removal rate that can be expected.
 - (b) What are the characteristics required for the good dielectric fluid in EDM. Also, discuss how flushing influence the MRR and surface finish and suggest good flushing technique for machining blind cavities.
- 6
 - (a) Explain the production of laser beam and working principle of laser beam machining.
 - (b) LBM and EDM both are thermal processes. However, it is found that the first one results in more thermal damage to the machined component than the second one. Is it true? Justify your answer.
- 7
 - (a) Explain Plasma Arc machining process with a neat sketch.
 - (b) Write the specific applications, advantages and limitations of plasma Arc machining process.
- 8
 - (a) Explain the working principle of MAF with the help of a neat sketch. Clearly show lines of magnetic force, magnetic equipotential lines, direction of pressure acting on the workpiece, direction of rotary motion, and a semi magnetic abrasive particle.
 - (b) Write the type and size of the abrasive and magnetic particles used in MAF.

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- 1 (a) Write the constraints that limit the performance of different kind of modern machining processes. Also, write the circumstance under which individual process will have advantage over others.
(b) Discuss the important factors that should be considered during the selection of a modern machining process for a given job.
- 2 A cylindrical impression of 10 mm diameter and 1 mm deep is to be made on a WC specimen. Feed force is constant, and is equal to 5 N. Average diameter of grains in the slurry is 10 μm . Tool oscillates with the amplitude of 30 μm at 20 KHz. Abrasive and water ratio in the slurry is 1. Fracture hardness of WC workpiece may be taken as 7000 N/mm^2 and that of copper tool as 1500 N/mm^2 . Determine the approximate time required to machine the job. Assume $K_1 = 0.3$, $K_2 = 1.8 \text{ mm}^2$ and $K_3 = 0.6$ and abrasive density = 3.8 g/cm^3 . Make the assumptions if necessary.
- 3 (a) Explain the working principle of water jet machining.
(b) Write the factors that affect the performance of WJM process. Discuss their effects in brief.
(c) Write the practical applications of water jet machining.
- 4 (a) What is the working principle of ECM? What are the materials commonly used for making a tool for use in this method? Is there any limitation on the type of material that can be machined by EDM?
(b) What are the functions of an electrolyte? What factors need to be considered while selecting it?
- 5 (a) During electric discharge drilling of a 15 mm diameter hole in a plate of 6.0 mm thickness, brass as tool and kerosene as dielectric are used. The resistance and capacitance in the R-C circuit are 50 Ω and 20 μF respectively. The supply voltage is 150 V and the gap is maintained such that discharge takes place at the condition of maximum power delivery to the discharge circuit. Assume the value of constant 0.18 to get MRR in mm^3/min . Also calculate the approximate cycle time.
(b) Discuss the factors influencing the choice of electrode material in EDM.
- 6 (a) Explain the working principle of EBM process. Make the necessary sketch.
(b) How work table is protected from getting damaged by the electron beam which has completely penetrated the workpiece?
(c) Write four specific applications where you feel that EBM should be the preferable choice.
- 7 (a) Discuss the parameters that govern the performance of PAM.
(b) Write the specific applications of PAM.
- 8 (a) With the help of a neat diagram, explain the working principle of AFM process.
(b) Comment on the re-use of abrasives in AFM.

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- 1 (a) Briefly discuss the requirements that demand the use of modern machining processes.
(b) How will you decide to recommend specific advanced machining processes for:
(i) Cutting a glass plate into two pieces, (ii) Making hole in a mild steel workpiece.
- 2 Find out the approximate time required to machine a hole of diameter equal to 6.0 mm in a tungsten carbide plate (fracture hardness = 6900 N/mm^2) of thickness equal to one and half times of hole diameter. The mean abrasive grain size is 0.015 mm diameter. The feed force is equal to 3.5 N. The amplitude of tool oscillation is $25 \mu\text{m}$ and the frequency is equal to 25 KHz. The tool material used is copper having fracture hardness equal to 1500 N/mm^2 . The slurry contains one part abrasive to one part of water. Take the values of different constants as $K_1 = 0.3$, $K_2 = 1.8 \text{ mm}^2$ and $K_3 = 0.6$ and abrasive density = 3.8 g/cm^3 .
- 3 (a) Write the names of various elements of AWJM and explain them, in brief.
(b) Why a need is being felt to develop a system which can directly use slurry instead of mixing abrasives and water?
(c) Write about the applications of WJM.
- 4 (a) Explain the mechanism of material removal during ECG and how it is different from ECM.
(b) Why the life of the ECG wheel is much higher than conventional grinding wheel?
(c) What do you understand by in-process dressing during ECG? Write its merits and demerits.
- 5 (a) For RC circuit, adjusted for maximum power delivery condition, the following data are available: $R = 250 \Omega$, $C = 25 \text{ mF}$ and supply voltage is 75 V. Calculate charging current and frequency of discharge when the circuit is closed.
(b) With the help of a neat sketch, explain the mechanism of material removal in EDM.
- 6 (a) Describe, with the help of a sketch, the constructional features of an 'electron gun' used for generating an electron beam in electron beam machining.
(b) Write short notes on:
(i) Process capabilities of EBM and (ii) Applications of EBM.
- 7 (a) Discuss various parameters that influence the performance of chemical machining process.
(b) Mention the advantages and limitations of chemical machining process.
- 8 Write elaborately on the principle of working, advantages and limitations of selective laser sintering.

MODERN MANUFACTURING METHODS
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- 1 Explain the need for use of non-traditional machining processes compared to the traditional ones.
- 2 (a) Discuss the effects of the following parameters on the rate of material removal and surface finish obtainable in ultrasonic machining:
(i) Amplitude and frequency of vibration. (ii) Abrasive grit size. (iii) Static load.
(b) Calculate the depth of indentation produced on glass surface in ultrasonic machining by the throwing action of abrasive grain of 100 μm diameter. The following data are available:
Amplitude of vibration 0.1 mm
Frequency 20 KHz
Abrasive density 3 kg/m^3
Yield strength of glass 4.0 $\times 10^{11}$ N/m^2 .
- 3 (a) Explain the working principle of AJM process with neat schematic diagram.
(b) With the help of sketches, show the effect of stand-off distance on:
(i) Width of cut, (ii) Material removal rate.
(c) 'Cutting tool' never dulls or breaks in WJM. Explain.
- 4 (a) Derive an equation for the maximum permissible feed rate of the cathode tool, and hence, deduce the relation for the electrolyte temperature change for a given feed rate of cathode tool.
(b) List the process parameters that affect the material removal rate and surface quality in electro chemical machining.
- 5 (a) In a RC circuit, supplied voltage 100 V, current 1 A, and sparking takes at maximum power delivery condition. The pulse frequency is 10 kHz find the energy content in each spark if every discharge gives only one spark.
(b) Mention advantages, disadvantages and applications of EDM.
- 6 (a) What is laser and how is it used to machine the materials? Also, discuss about the process characteristics.
(b) Make a comparison between laser beam and electron beam machining processes on the basis of their applications and limitations.
- 7 Explain the steps involved in chemical machining with sketch. What are the advantages, limitations and applications of the process?
- 8 (a) Explain the working principle of stereo lithography with a neat diagram.
(b) Explain the principle applications of electro stream drilling process.

POWER PLANT ENGINEERING
(Mechanical Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) At least one deaerator is required in a steam power plant. Justify.
(b) How the performance of a thermal power plant depends on ambient temperature?
(c) In India, more than half of energy is from coal. Brief the other energy resources along with the power generation in India.
- 2 (a) The use of cooling tower in a thermal power plant reduces the thermal pollution compared to a plant without its use. Explain.
(b) How is the process of coal pulverization carried out? Explain the process with a neat line sketch.
- 3 (a) What is the objective of supercharging? Why it is more beneficial in a CI engine compared to an SI engine?
(b) What do you understand by smoke limit?
(c) Why turbochargers are superior to superchargers?
- 4 (a) Compare the air fuel ratio in a gas turbine combustion chamber with the diesel engine combustion chamber.
(b) A gas turbine plant of 800 kW capacities takes the air at 1.01 bar and 15°C. The pressure ratio of the cycle is 12 and maximum temperature is limited to 1150°C. A regenerator of 75% effectiveness is added in the plant to increase the overall efficiency of the plant. The pressure drop in the combustion chamber is 0.15 bar as well as in the regenerator is also 0.15 bar. Assuming the isentropic efficiency of the compressor 85% and of the turbine 92%. Determine the plant thermal efficiency. Neglect the mass of the fuel.
- 5 (a) What is the difference between storage and pondage in a hydel power plant?
(b) What are the important features of micro hydel plant?
- 6 Prove that in case of horizontal axis wind turbine maximum power can be obtained when exit velocity = $\frac{1}{3}$ wind velocity and $P_{max} = \frac{8}{27} \rho AV^3$.
- 7 Is it possible to operate a nuclear power plant on a Brayton cycle? Draw a neat sketch of such reactor with construction and working details.
- 8 (a) Analyze the cost for a typical 10 MW biomass power plant.
(b) The fixed costs of a thermal station are Rs. 8000 per kW of installed capacity per year. The fuel and operating costs are Rs. 1.5 per kWh generated. Find the cost of electrical energy per kWh at station load factors of 100%, 75% and 25%.

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B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

POWER PLANT ENGINEERING
(Mechanical Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) What are the factors to be considered to install a typical 5 MW solar PV power plant?
(b) Explain about coal circuit, air circuit, water/steam circuit and cooling water circuit in a modern steam power plant.
- 2 (a) What is the difference between ash and dust? Enumerate the available equipment for ash handling and dust handling in a thermal power plant.
(b) What are the advantages and disadvantages of a unit system and central system for pulverized fuel firing?
- 3 (a) Can you prefer a turbo charger for a diesel power plant? Why?
(b) Explain the common rail fuel injection system used in diesel power plant with a neat sketch.
- 4 (a) What are the NO_x controlling techniques used in a gas turbine power plant?
(b) Explain about the operational flexibility in triple pressure heat recovery steam generator (HRSG) used in combined cycle power plant.

- 5 (a) What do you mean by 'specific speed' of a turbine?
(b) The runoff data of a river at a particular site is tabulated below:

Month	1	2	3	4	5	6	7	8	9	10	11	12
Average discharge/month (millions of m ³)	35	20	25	15	10	0	65	95	120	100	45	45

- (i) Draw a hydrograph and find the mean flow, (ii) also draw the flow duration curve and (iii) find the power in MW available at mean flow if the head available is 80 m and overall efficiency of generation is 85%. Take each month 30 days.
- 6 (a) Explain how local winds are created during daytime and night time.
(b) With the help of a neat sketch, discuss the different types of rotors used in wind turbines.
- 7 (a) Differentiate between coal fired steam power plant and nuclear based steam power plant.
(b) Explain the working and construction of a modern nuclear power plant with a neat sketch.

- 8 It is proposed to supply a load with a maximum demand of 500 MW and load factor of 70%. Choice is to be made from a nuclear power plant, a hydraulic power plant and a steam power plant. Calculate the overall cost per kWh in case of each scheme as given below:

Cost	Steam power plant	Hydroelectric power plant	Nuclear power plant
1. capital cost per MW installed	Rs. 3 crore	Rs. 4 crore	Rs. 5 crore
2. interest	6%	5%	5%
3. Depreciation	6%	4%	5%
4. Operating cost (including fuel) per kWh	30 paise	5 paise	15 paise
5. Transmission and distribution cost per kWh	2 paise	3 paise	2 paise

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B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

POWER PLANT ENGINEERING

(Mechanical Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) In a steam power plant, a deaerator is located at elevated place. Justify.
(b) Describe the properties of Indian coal.
(c) Why most of Indian power plants are coal based thermal power plant? Suggest and brief a new technology to reduce the emissions of coal based thermal power plant.
- 2 (a) Explain the developments in coal combustion equipment.
(b) Recommend a draft out of forced, induced and balanced drafts for a thermal plant. Justify your recommendation.
- 3 (a) Draw a neat sketch of engine lubrication system with neat sketch and elaborate its construction and working details.
(b) Explain the starting and stopping processes of an engine.
- 4 A gas turbine power plant is operated between 1 bar and 9 bar pressures and minimum and maximum cycle temperatures are 25 °C and 1250 °C. Compression is carried out in two stages with perfect intercooling. The gases coming out from HP turbine are heated to 1250 °C before entering into LP turbine. The expansions in both turbines are arranged in such a way that each stage develops same power. Assuming compressors and turbines isentropic efficiencies as 83%.
- 5 (a) Enumerate the factors affecting the run-off.
(b) What are the suitable operational conditions for a Kaplan turbine? Describe the working of this turbine with a neat sketch.
- 6 (a) Discuss the advantages and disadvantages of horizontal and vertical axis windmill.
(b) Explain the methods that are used to overcome the fluctuating power generation of windmill.
- 7 (a) What is nuclear stability? Why the elements of higher mass number are not stable?
(b) What is meant by critical size and critical mass?
(c) Write about radiation waste disposal.
- 8 (a) Brief about the environmental effects caused with coal power plant.
(b) A 300 MW thermal power station is to supply power to a system having maximum and minimum demand of 240 MW and 180 MW respectively in a year. Assuming the load duration curve to be a straight line, estimate the (i) load factor and (ii) capacity factor.

POWER PLANT ENGINEERING
(Mechanical Engineering)

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- 1 (a) What is the dual function of a deaerator in steam power plant?
(b) Brief about the various stages involved in coal handling of a steam power plant with a neat flow diagram showing all the stages.
- 2 (a) Classify the solid fuel firing methods.
(b) Suggest one type of coal firing method for a 220 MW steam power plant. Justify your recommendation.
- 3 (a) Why supercharging is more beneficial in a CI engine compared to an SI engine?
(b) Starting from the fuel tank to diesel engine combustion, draw a schematic line diagram showing the fuel lines and explain its working.
- 4 (a) How a GT-ST combined cycle power plant addresses the limitations of individual plants?
(b) Analyze the influence of air fuel ratio on gas power plant's performance, working on simple Brayton cycle with the following data. Air condition at compressor inlet is 1.01325 bar and 25 °C. The compression ratio is 10. The heating value of fuel is 50 MJ/kg. The gas turbine exhaust pressure is 1.1 bar. Assume compressor and turbine isentropic efficiencies as 83% and 89% respectively. Vary the air fuel ratio from 40 to 55 in steps of 5 to analyze the specific power and thermal efficiency variations.
- 5 (a) What is the difference between canal, flume and tunnel?
(b) Find the specific speed when 150 kW power is to be generated under a head of 100 meter at 300 rpm. Also suggest the type of turbine to be used based on specific speed.
- 6 (a) What are the advantages of vertical axis machines over horizontal type?
(b) Describe about a rotor for relatively low velocity wind.
- 7 (a) Enumerate the radioactive waste disposal methods.
(b) Write about a nuclear power plant developed at Canada with a neat sketch.
- 8 (a) What parameters are required to plan a power plant? Enumerate the parameters involved in planning.
(b) A thermal power plant of 210 MW capacity has the maximum load of 160 MW. Its annual load factor is 0.6. The coal consumption is 1 kg per kWh of energy generated and the cost of coal is Rs. 450 per tonne. Calculate: (i) the annual revenue earned if energy is sold at Rs. 1 per kWh and (ii) the capacity factor of the plant.

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B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations, December/January 2013/14

OPERATIONS RESEARCH

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

- 1 The Xeon company owns a small paint factory that produces both interior and exterior house paints for wholesale distribution. Two basic raw materials, A and B, are used to manufacture the paints. The maximum availability of A is 6 tons a day that of B is 8 tons a day. The daily requirements of the raw materials per ton of interior and exterior paints are summarized in the following table.

Raw material	Tons of raw material per ton of paint	
	Exterior	Interior
Raw material A	1	2
Raw material B	2	1

A market survey has established that the daily demand for interior paint cannot exceed that of exterior paint by more than one ton. The survey also shows that the maximum demand for interior paint is limited to 2 tons daily. The wholesale price per ton is Rs.3000 for exterior paint and Rs.2000 for interior paint. Use graphical method to determine number of units of interior and exterior paints should the company produce daily to maximize gross income.

- 2 A company has factories A, B and C which supply warehouses at P, Q, R and S. Monthly factory capacities are 160, 150 and 190 units respectively. Monthly warehouse requirements are 80, 90, 110 and 160 units respectively. Unit shipping costs (in rupees) are as follows:

		Warehouse			
		P	Q	R	S
Factory	A	42	48	38	37
	B	40	49	52	51
	C	39	38	40	43

Determine the optimum solution to the problem.

- 3 The following failure rates have been observed for a certain type of light bulbs:

End of week :	1	2	3	4	5
Probability of :	10	25	50	80	100

There are 1000 bulbs in use, and it costs Rs.2 to replace an individual bulb, which has burnt out. If all bulbs were replaced simultaneously it would cost 50 paise per bulb. It is proposed to replace all bulbs at fixed intervals, whether or not they have been burnt out and continue replacing burnt out bulbs as they fail. At what intervals should all the bulbs be replaced? Determine the optimum average cost of group replacement policy.

- 4 Solve the game whose payoff matrix is given by

		Player B			
		Player A	2	1	0
1	0		3	2	

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- 5 A computer center is equipped with three digital computers, all of the same type and capability. For each user, the time for writing and inputting a program is exponential with mean rate 0.5 per hour. The execution time per program is exponentially distributed with mean rate 2 per hour. Assuming that the center is in operation on a full-time basis with non-finite queue length, and neglecting the effect of computer downtime, find the following, (i) the probability that a program is not executed immediately upon receipt at the center, (ii) the average time until a program is released from the center, (iii) the average number of programs awaiting execution, (iv) the expected number of idle computers, (v) the percentage of time the computer center is idle.
- 6 (a) Discuss with graphical representation the continuous variable of a probabilistic inventory model with instantaneous demand and no set-up cost.
- (b) The demand of an item in a company in 18000 units per year and the company can produce the item at a rate of 3000 per month. The cost of set up in Rs.500 and the holding cost of 1 unit per month is Rs.0.15. Determine the optimum manufacturing quantity and minimum inventory cost. Also determine the manufacturing time and the time between supplies.
- 7 A corporation is entertaining proposals from its three plants for possible expansion of facilities. The corporation is budgeting Rs.5 million for allocation to all three plants. Each plant is required to submit its proposals giving total cost C and total revenue R for each proposal (summary table).

Proposal	Plant 1		Plant 2		Plant 3	
	C ₁	R ₁	C ₂	R ₂	C ₃	R ₃
1	0	0	0	0	0	0
2	1	5	2	8	1	3
3	2	6	3	9	-	-
4	-	-	4	12	-	-

Use dynamic programming to find out the optimal allocation of the budget to three plants for maximum total revenue.

- 8 A company has a single service station which has the following characteristics: the mean arrival rate of customers and the mean service time are 6.2 minutes and 5.5 minutes respectively. The time between an arrival and its service varies from one minute to seven minute. The arrival and service time distributions are given below:

Time (minutes)	Arrival (probability)	Service (probability)
1-2	0.05	0.10
2-3	0.20	0.20
3-4	0.35	0.40
4-5	0.25	0.20
5-6	0.10	0.10
6-7	0.05	--

The queuing process starts at 11AM and closes at 12 PM. An arrival moves immediately into the service facility if it is empty. On the other hand, if the service station is busy, the arrival will wait in the queue. Customers are served on the first come, first served basis. Determine average waiting time of customer before service and time a customer spends in the system using Manto-Carlo simulation technique by hand calculations.

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B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations, December/January 2013/14

OPERATIONS RESEARCH

(Mechanical Engineering)

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- 1 Using slack, surplus and artificial variables; solve the following LP problem.

$$\text{Maximize } z = 6x_1 + 4x_2$$

$$\text{Subject to } 2x_1 + 3x_2 \leq 30$$

$$3x_1 + 2x_2 \leq 24$$

$$x_1 + x_2 \geq 3$$

$$x_1, x_2 \geq 0.$$

- 2 Find an optimum solution to the following transportation problem with unit transportation cost.

		Warehouse				
		W ₁	W ₂	W ₃	W ₄	
Factory	F ₁	19	30	50	10	7
	F ₂	70	30	40	60	9
	F ₃	40	8	70	20	18
		5	8	7	14	
		Warehouse Requirements				

- 3 (a) The maintenance cost and resale value per year of a machine whose purchase price is Rs.7000 are given below:

Year	:	1	2	3	4	5	6	7	8
Maintenance cost (Rs)	:	900	1200	1600	2100	2800	3700	4700	5900
Resale value (Rs)	:	4000	2000	1200	600	500	400	400	400

When should the machine be replaced?

- (b) Discuss the replacement of items that fail suddenly and completely.
- 4 Solve the following game whose payoff matrix for player A is given by

		Player B		
		1	3	11
Player A	8	1	3	11
		8	5	2

- 5 In a car-wash service facility, information gathered indicates that cars arrive for service according to a Poisson distribution with mean 4 per hour. The time for washing and cleaning each car varies but is found to follow an exponential distribution with mean 10 minutes per car. The facility cannot handle more than one car at a time. Assume that the calling source is so large and moreover, there is enough parking space to accommodate all arriving cars. What is average waiting of a customer in the system? How many cars are waiting on the average when a customer arrives? Determine probability that there are 10 cars or more waiting in the queue. Find the probability that an arrival will have to wait more than or equal to 25 minutes in queue and service time. Determine the probability that an arriving car must wait prior to being washed.

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- 6 (a) The demand for a particular item is 18000 units per year. The holding cost per unit is Rs.1.20 per year and the cost of one order is Rs.400. No shortages are allowed and the replacement rate is instantaneous. Determine: (a) Optimum order quantity (b) Number of orders per year (c) Time between orders and (d) Total cost per year when the cost of one unit is Rs.1.
- (b) Consider a single period instantaneous demand of an item with holding cost Rs.1 per unit and shortage cost of Rs.4.00 if Rs.2.00 be the purchasing cost per unit then determine the optimal order level of the inventory, given the probability distribution of the item in the following table.

Z:	0	1	2	3	4	5
p(z):	0.1	0.2	0.25	0.2	0.15	0.1

- 7 In 18th century, when transportation systems were not developed, a family wanted to travel to reach a friend's house in other part of the country. But they had a choice of various routes and haltages in between from their home to final destination. Cost of travel from each point to the other points en route, based on relevant factors such as distance, difficulties, mode of transportation are given below:

	B	C	C		E	F	G		H	I		J
A	2	4	3	B	7	4	6	E	1	4	H	3
				C	3	2	4	F	6	3	I	4
				D	4	1	5	G	3	3		

Use dynamic programming to find the most safest route of travelling so that the total travelling cost becomes minimum.

- 8 The automobile company manufactures around 150 scooters. The daily production varies from 146 to 154 depending upon the availability of raw materials and other working conditions:

Production (per day):	146	147	148	149	150	151	152	153	154
Probability :	0.04	0.09	0.12	0.14	0.11	0.10	0.20	0.12	0.08

The finished scooters are transported in a specially arranged lorry accommodating 150 scooters. Simulate the process for 15 runs to find out (i) the average number of scooters waiting in the factory and (ii) the average number of empty space on the lorry.

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- 1 Solve the following LP problem.

$$\text{Max } z = 3x_1 + 2x_2 + 4x_3$$

$$\text{Subject to } 2x_1 + 3x_2 + x_3 \leq 30$$

$$x_1 + x_2 + 3x_3 \leq 30$$

$$x_1 + 3x_2 + x_3 \leq 24$$

$$x_1, x_2, x_3 \geq 0.$$

- 2 Find the sequence that minimizes the total elapsed time required to completing the following jobs on
- M_1
-
- M_2
-
- M_3
-
- M_4
- machines in which passing not allowed.

Jobs	A	B	C	D	E
Machine M_1	10	12	8	15	16
Machine M_2	3	2	4	1	5
Machine M_3	5	6	4	7	3
Machine M_4	14	7	12	8	10

Determine the minimum total elapsed time and idle time of each machine.

- 3 The following failure rates have been observed for a certain type of transistors in a digital computer:

End of week	1	2	3	4	5	6	7	8
Probability of failure to date	0.05	0.13	0.25	0.43	0.68	0.88	0.96	1.00

There are 1000 transistors in use. The cost of replacing an individual failed transistor is Rs.1.25. The decision is made to replace all these transistors simultaneously at fixed intervals, and to replace the individual transistors as they fail in service. The cost of group replacement is Rs.0.30 per transistor.

- (a) What is the best interval between group replacement and its associated average total cost?
(b) At what group replacement price per transistor would a policy of strictly individual replacement become preferable to the adopted policy?

- 4 Solve the following 4 x 2 game whose payoff matrix given for player A.

		Player B	
		1	2
Player A	1	2	4
	2	2	3
	3	3	2
	4	-2	6

Contd. in page 2

Code: 9A03701

- 5 (a) Explain the basic elements of queuing.
 (b) At a one-man barber shop, customers arrive according to Poisson distribution with a mean arrival rate of 5 per hour and hair cutting time was exponentially distributed with an average hair cut taking 10 minutes. It is assumed that because of his excellent reputation, customers were always willing to wait. Calculate the following: (i) average number of customers in the shop and the average number of customers waiting for a haircut. (ii) The percent of time an arrival can walk right in without having to wait. (iii) The percentage of customers who have to wait prior to getting into the barber's chair.
- 6 A company can produce an item or buy it from a contractor. If it is produced locally, it will cost Rs.20 each time the machines are set up. The production rate is 100 units per day. If it is bought from a contractor, it will cost Rs.15 each time an order is placed. The cost of maintaining the item in stock, whether bought or produced, is Rs.0.02 a day. The company's usage of the item is estimated at 26000 units annually. Assuming that the company operates 300 days with no shortage, should they buy or produce. Justify your answer.
- 7 The owner of a chain of four grocery stores has purchased six crates of fresh strawberries. The estimated probability distribution of potential sales of the strawberries before spoilage differs among the four stores. The following table gives the estimated total expected profit at each store, when it is allocated various number of boxes:

		Store			
		1	2	3	4
Number of boxes	0	0	0	0	0
	1	4	2	6	2
	2	6	4	8	3
	3	7	6	8	4
	4	7	8	8	4
	5	7	9	8	4
	6	7	10	8	4

For administrative reasons, the owner does not wish to split crates between stores. However, the owner is willing to distribute zero crates to any of his stores. Use dynamic programming to find the allocation of six crates to four stores so as to maximize the expected profit.

- 8 An observation of past data shows the following patterns in respect of inter-arrival duration and service duration in a single channel queueing system.

Frequency distribution of inter-arrival times		Frequency distribution of service times	
Time between arrivals (min)	Frequency (%)	Service time (min)	Frequency (%)
1	35	1.0	20
2	25	1.5	35
3	20	2.0	25
4	12	2.5	15
5	8	3.0	5

Use Monte-Carlo simulation technique to simulate the system for 12 arrivals in order to find the percentage of time the server is idle.

Code: 9A03701

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations, December/January 2013/14

OPERATIONS RESEARCH

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 Solve the following LP problem.

$$\text{Maximize } z = 2x_1 + 3x_2 - 5x_3$$

$$\text{Subject to } x_1 + x_2 + x_3 = 7$$

$$2x_1 - 5x_2 + x_3 \geq 10$$

$$x_1, x_2, x_3 \geq 0.$$

- 2 (a) A machine tool company decides to make four subassemblies through four contractors. Each contractor is to receive only one subassembly. The cost of each subassembly is determined by the bids submitted by each contractor and is shown in table in hundreds of rupees. Assign the different subassemblies to contractors so as to minimize the total cost.

		Contractor			
		C ₁	C ₂	C ₃	C ₄
Subassembly	S ₁	15	13	14	17
	S ₂	11	12	15	13
	S ₃	13	12	10	11
	S ₄	15	17	14	16

- (b) Use graphical method to minimize the time needed to process the following jobs (job1 and job2 on the machines (A, B, C, D and E) shown, i.e. for each machine find the job which should be done first. Also calculate total time elapsed to complete both the jobs:

Job 1	Sequence	A	B	C	D	E
	Time	3	4	2	6	2
Job 2	Sequence	D	C	A	D	E
	Time	5	4	3	2	6

- 3 A manufacturer is offered two machines A and B machine A is priced at Rs.5000 and running costs are estimated at Rs.800 for each of the first five years, increasing by Rs.200 per year in sixth and subsequent years. Machine B, which has the same capacity as A, costs Rs.2500 but will have running costs of Rs.1200 per year for six years, increasing by Rs.200 per year thereafter. Assumed that the machines will eventually be sold for scrap at a negligible price. If money is worth 10% per year, which machine should be purchased?

Contd. in page 2

Code: 9A03701

- 4 (a) Solve the following payoff matrix, which represents player A's gain

		Player B			
		B ₁	B ₂	B ₃	B ₄
Player A	A ₁	8	2	9	5
	A ₂	6	5	7	18
	A ₃	7	3	-4	10

- (b) Determine the optimal strategies for both the players A and B for the payoff matrix.

		Player B	
		2	5
Player A	7	3	

- 5 Arrival rate of telephone calls at a telephone booth are according to Poisson distribution, with an average time of 9 minutes between two consecutive arrivals. The length of telephone call is assumed to be exponentially distributed, with mean 3 minutes. (i) Determine the probability that a person arriving at the booth will have to wait. (ii) Find the average queue length. (iii) Find the average time a customer spends in the system. (iv) Find the average number of customers in the system. (v) What is the probability that an arrival will have to wait for more than 10 minutes before the phone is free. (vi) The telephone company will install a second booth when convinced that an arrival would expect to have to wait at least four minutes for phone. Find the rate of arrival which will justify a second booth.
- 6 The estimated monthly demand for a product is 200 units, the monthly holding costs amount to 2% of the average inventory value, and the ordering costs are Rs.100 per order. No shortage is to be allowed. The normal price charged by the supplier is Rs.10. However, a discount of 7.5% is allowed on orders between 500 and 749. A 12.5% quantity discount on orders exceeding or equal to 750. Determine the most economical order quantity and its associated cost.
- 7 Use dynamic programming to solve the following linear programming problem.

$$\begin{aligned} \text{Max } Z &= x_1 + 9x_2 \\ \text{Subject to constraints } &2x_1 + x_2 \leq 25 \\ &x_2 \leq 11 \\ &x_1, x_2, \geq 0. \end{aligned}$$

- 8 A company manufactures around 200 mopeds. Depending upon the availability of raw materials and other conditions, the daily production has been varying from 196 mopeds to 204 mopeds, whose probability distribution is as given below:

Production per day	196	197	198	199	200	201	202	203	204
Probability	0.05	0.09	0.12	0.14	0.20	0.15	0.11	0.08	0.06

The finished mopeds are transported in a specially designed three storeyed lorry that can accommodate only 200 mopeds. Using 15 random numbers, simulate the process to find out: (i) The average number of mopeds waiting in the company and (ii) the average number of empty spaces on the lorry.

Code: 9A03702

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

AUTOMATION AND ROBOTICS

(Common to ME & MCT)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Differentiate between fixed, programmable and flexible automation.
(b) Discuss the operation of high speed insertion devices used in automated systems.
- 2 Discuss work in process storage and explain analysis of two stage flow line with storage buffers.
- 3 (a) Explain the basic concept of assembly process.
(b) Define line balancing problem with relevant 'e' terminologies.
- 4 (a) Define a robot and compare with a crane.
(b) Describe basic components of a robot and motions.
- 5 (a) What is forward kinematics?
(b) Write a note on Denavit - Hartenberg conventions for robot motion analysis.
- 6 What is trajectory? A joint of a robot manipulator is required to move from $\theta = 60^\circ$ to 150° in 6 seconds. Find the cubic polynomial to generate the smooth trajectory for the joint. What is the maximum velocity and acceleration for the trajectory?
- 7 (a) Distinguish between tactile and non-tactile sensors.
(b) Sketch and explain the working of an acoustic sensor.
- 8 (a) What is meant by a robot work cell? List the components.
(b) Explain the different robot cell layouts for an inspection system?

Code: 9A03702

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

AUTOMATION AND ROBOTICS

(Common to ME & MCT)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Differentiate between hoppers and orienters.
(b) Explain the hardware components of automation and process control that can be engaged to improve productivity.
- 2 Explain analysis of two stage transfer/flow lines with and without buffers storage.
- 3 (a) Explain the ways to improve automated flow lines.
(b) Discuss station time and balance delay in line balancing.
- 4 Explain basic robot configurations with neat sketches.
- 5 (a) Discuss solutions for inverse and forward kinematics problem for a 2 DOF robot with schematic.
(b) Explain skew motion of a robot manipulator.
- 6 (a) Explain point-to-point trajectory and continuous trajectory.
(b) Explain the following group commands used in robot programming:
 - (i) Motion control.
 - (ii) Program control.
- 7 (a) Write a note on light based range sensors.
(b) Mention the major advantages and disadvantages of hydraulic actuators over electrical actuators.
- 8 Explain the applications robots in following applications:
 - (a) Material transfer.
 - (b) Machine loading/unloading.

Code: 9A03702

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

AUTOMATION AND ROBOTICS

(Common to ME & MCT)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Define automation. Explain various types of automation.
(b) Write a note on automated feeders.
- 2 Explain transfer lines with more than two stages with storage buffer.
- 3 (a) Explain features of flexible assembly lines.
(b) Discuss cycle time and line efficiency in line balancing.
- 4 Discuss linkage actuation, gear and rack actuation and cam actuation of robot grippers with sketches.
- 5 What are homogeneous transformations and perform the following transformations from a initial position vector $3i - 6k + 8k$:
(a) Translation of 5 units along y-axis and rotation of 40° about z-axis.
(b) Translation of 8 units along x-axis, 12 units along z-axis and rotation of 60° about y-axis.
- 6 (a) Explain skew motion of a robot manipulator.
(b) Discuss the features of second generation robot programming languages with example.
- 7 (a) Discuss and compare the different types of drives used in robots.
(b) Write a note on the principle of touch, force and torque sensors used in robotic systems.
- 8 Explain the features of robots in following applications:
(a) Arc welding.
(b) Assembly operations.

Code: 9A03702

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

AUTOMATION AND ROBOTICS

(Common to ME & MCT)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) State basic elements of an automated system.
(b) Explain levels of automation in manufacturing systems.
- 2 Write note on automated storage and retrieval system with a case study.
- 3 (a) Explain the manual assembly lines and its qualitative features.
(b) Write a note on flexible assembly lines.
- 4 (a) Define the end effector. What are the types of end effectors?
(b) Explain the anatomy of a robot with a neat sketch.
- 5 (a) Describe a 6 degree of freedom robot with a neat sketch.
(b) Derive the Jacobian matrix for 3 degrees of freedom cylindrical robot.
- 6 (a) Explain the manual and powered lead through methods of robot programming.
(b) Compare lead through methods with textual language programming.
- 7 (a) What are the advantages of using pneumatic drives in the robots?
(b) Distinguish between DC motor and stepper motor.
- 8 Explain the features and application of robots in following applications:
(a) Spot welding.
(b) Spray painting.

Code: 9A03703

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

FINITE ELEMENT METHODS

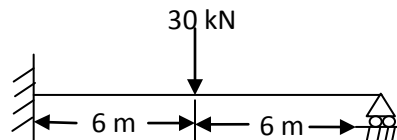
(Mechanical Engineering)

Time: 3 hours

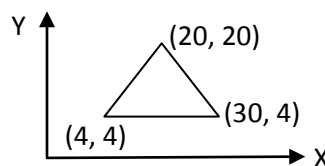
Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Explain the strain – displacement relations.
(b) Explain the constitutive relation for an orthotropic material. And also explain the effect of temperature on stress – strain relation of an orthotropic material.
- 2 Explain in detail the finite element modeling of one – dimensional problem.
- 3 Calculate the: (i) deflection under load (ii) shear force and bending moment at mid span and (iii) reactions at supports for the beam shown in figure. Take $E = 200 \text{ GPa}$ and $I = 24 \times 10^{-6} \text{ m}^4$.



- 4 Determine the element stresses for the triangular element shown in figure. The nodal displacements are given as $u_1 = 0.005 \text{ mm}$, $u_2 = 0.002 \text{ mm}$, $u_3 = 0.0 \text{ mm}$, $u_4 = 0.0 \text{ mm}$, $u_5 = 0.004 \text{ mm}$, and $u_6 = 0.0 \text{ mm}$. Take $E = 200 \text{ GPa}$ & $\nu = 0.3$. Use unit thickness for plane strain.



- 5 Derive the element stiffness matrix for an 4-noded iso-parametric quadrilateral element.
- 6 Explain 2-D finite element formulation in heat transfer analysis.
- 7 Explain the 1-D finite element formulation in fluid flow and thermal stress analysis.
- 8 Write short notes on:
 - (a) Dynamics of a spring mass system.
 - (b) Time-dependent heat transfer.

Code: 9A03703

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

FINITE ELEMENT METHODS

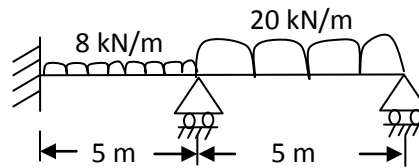
(Mechanical Engineering)

Time: 3 hours

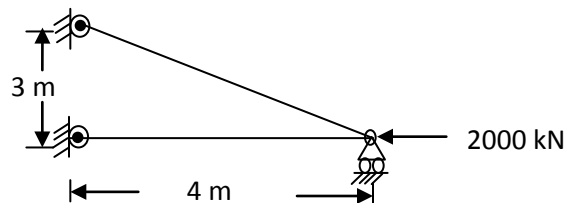
Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

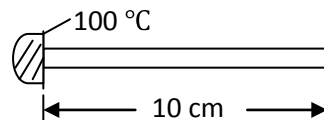
- 1 Discuss the basic steps involved in FEM and explain in detail.
- 2 Analyze the beam shown in figure by finite element method and determine the end reactions. Also determine the deflections at mid spans given $E = 2 \times 10^5 \text{ N/mm}^2$ and $I = 5 \times 10^5 \text{ nm}^4$.



- 3 Determine the nodal displacement, element stresses and support reactions for the two-bar truss shown in figure. Take $E = 210 \text{ GPa}$ and $A = 600 \text{ mm}^2$ for each element.



- 4 Derive the shape functions, strain-displacement matrix, stiffness matrix and nodal load vectors for a constant strain triangular element.
- 5 Derive the stiffness matrix and nodal load vectors for an axisymmetric pressure vessel.
- 6 Determine the temperature distribution in 1-D rectangular cross-section as shown in figure. The fin has rectangular cross-section and is 10 cm long, 4 cm wide and 1 cm thick. Assume that convection heat ion occurs from the end of the fin. Take $h = 4 \text{ w/cm}^\circ \text{C}$, $h = 0.1 \text{ w/cm}^2 \text{c}^\circ$ and $T_\infty = 20^\circ \text{C}$.



- 7 Explain the 2-D finite element formulation using flow chart and a fluid flow program.
- 8 Write short notes on:
- Time dependent one dimensional bar analysis.
 - Beam element man matrices and natural frequencies in dynamic analysis.

Code: 9A03703

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

FINITE ELEMENT METHODS

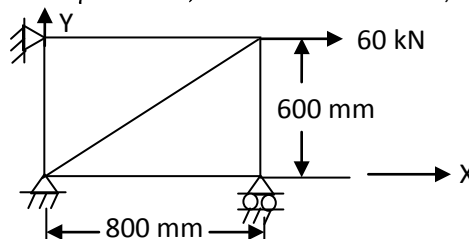
(Mechanical Engineering)

Time: 3 hours

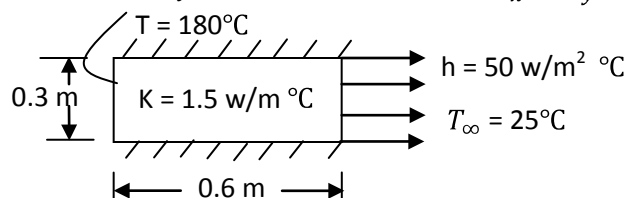
Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

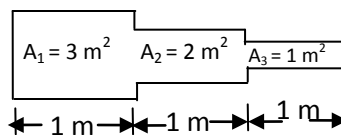
- 1 (a) Write the advantages, disadvantages and limitations of finite element method.
(b) Explain the concept of finite element method.
- 2 Derive the element stiffness matrix for a 2-noded beam element.
- 3 Explain the Galerkin's residual method and its use to derive the one-dimensional bar element equations.
- 4 Find the nodal displacements and element stresses in the propped beam shown in figure. Idealize the beam into two CST elements as shown in the figure. Assume plane stress condition. Take $\mu = 0.25$, $E = 2 \times 10^5 \text{ N/mm}^2$, thickness = 18 mm.



- 5 Derive the strain-displacement matrix, stiffness matrix and nodal load vectors for a linear strain triangular element.
- 6 For the 2-D body shown in figure, determine the temperature distribution. The edges on the top and bottom of the body are insulated. Assume $K_x = K_y$. Use three element models.



- 7 Determine the potentials at the junctions, the velocities in each pipe and the volumetric flow rate for the smooth pipe of variable cross-section shown in figure. The potential at the left end is 10 m and that at the right end is 3 m. The permeability coefficient is 1 m/sec.



- 8 Write short notes on:
 - (a) Axis-symmetric solid element matrices in dynamic analysis.
 - (b) Time-dependent heat transfer.

Code: 9A03703

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

FINITE ELEMENT METHODS

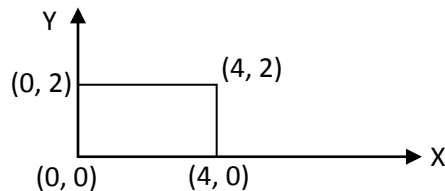
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Explain the constitutive relations for linear, elastic, homogeneous (i) anisotropic material and (ii) isotropic material.
(b) Explain the principle of discretization in FEM.
- 2 Derive the strain displacement matrix, stiffness matrix and nodal load vectors for a 2-noded 1-D element.
- 3 Explain the Galerkin's method for deriving beam element equations.
- 4 Explain in detail the concepts of plane stress and plane strain situations. And also write the constitutive relations for plane stress and plane strain conditions.
- 5 Determine J , B and σ at $r = 0$ and $s = 0$ for the four node quadrilateral element shown in figure. The nodal displacements are given by.
 $d = [0.0, 0.0, 0.02, 0.03, 0.06, 0.015, 0.10, 0.0]$ cm. Take $E = 20 \times 10^6$ N/cm² & $\nu = 0.25$. Assume plane stress conditions.



- 6 (a) Explain in detail the one dimensional formulation of fin.
(b) Derive the basic differential equation in heat transfer analysis.
- 7 Explain 2-D finite element formulation in fluid flow and thermal stress analysis.
- 8 Write short notes on:
 - (a) Numerical integration in time, dynamic natural frequencies of 1-D bar analysis.
 - (b) Plane stress/strain element matrices in dynamic analysis.

Code: 9A03704

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

INSTRUMENTATION AND CONTROL SYSTEMS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) What are the functional elements of the measurement system? Explain them in detail.
(b) Explain about analog and digital modes of operation in instrumentation system.
- 2 (a) Explain the use of eddy current non-contact transducer in detail.
(b) What is seebeck effect? How it is applied in temperature measurement?
- 3 (a) Compare venturimeter and orifice meter in pressure measurement.
(b) Briefly explain the operation of bourdon's pressure gauge with neat diagram.
- 4 Explain how ultrasonic principle is used in both level and flow measurement. Discuss in detail.
- 5 (a) How the electrical tachometers are functioning? Explain with neat sketch.
(b) Explain the principle and operation of accelerometer with neat sketch.
- 6 Explain the method of usage of resistance strain gauge for bending, compressive and tensile strains.
- 7 (a) Discuss the principle of operation of absorption psychrometer with neat sketch.
(b) Explain how torsion meters are functioning in torque measurement.
- 8 What is called transfer function? How it will be changed between open loop and closed loop systems?

Code: 9A03704

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

INSTRUMENTATION AND CONTROL SYSTEMS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) What is the use of statistical tools in measurement? Explain them in detail.
(b) Explain the terms:
 - (i) Resolution.
 - (ii) Threshold in a measurement system.
- 2 (a) Discuss about the construction and working principle of LVDT with neat diagram.
(b) Explain the term temperature compensation in thermocouple with suitable diagram.
- 3 (a) What is the role of diaphragm in pressure measurement? Explain how it operates.
(b) With neat diagram, explain the operation of the meledod gauge in pressure measurement.
- 4 (a) Brief about the principle and operation of rotameter with neat sketch.
(b) In level measurement, explain the operation of bubbler level indicators with neat sketch.
- 5 (a) Differentiate the functioning of stroboscope with tachometer.
(b) How the accelerometers are employed for inertial navigation?
- 6 What is a strain gauge? Explain the role of strain gauge when it is fitted about and below a cantilever beam.
- 7 (a) Discuss about the role of load cell in force measurement with neat diagram.
(b) Explain the principle and operation of dew point meter in humidity measurement.
- 8 (a) Classify the control systems used based on various factors.
(b) Explain the role of servo mechanisms in position control with neat diagram.

Code: 9A03704

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

INSTRUMENTATION AND CONTROL SYSTEMS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) What is calibration? Why it is important in measuring instruments?
(b) What is error in an instrument? What are the sources of error? Also explain the types of error.
- 2 (a) Explain the operation of capacitance transducer with neat diagram.
(b) How the temperature is measured with the help of thermistors? Explain with diagram.
- 3 (a) How the ionization principle is used in pressure measurement? Explain with neat diagram.
(b) A U tube manometer is used to measure a differential air pressure with a fluid of density 900 Kg/m^3 . The air is at 500 kPa and 25°C . Calculate the differential pressure, if the difference in the height of the fluid in the manometer is 200 mm . Express in units of kPa .
- 4 Compare the high pressure and low pressure measurement techniques. Explain any one method for each of them.
- 5 (a) Explain the functioning of non-contact type tachometer with neat sketch.
(b) Discuss the principle used in seismic instruments for vibration measurements.
- 6 Derive the expression for gauge factor in a strain gauge.
- 7 (a) Explain about torque measurement by dynamometers in detail.
(b) How the moisture content in the gases can be measured?
- 8 (a) Explain the role of servo mechanisms in temperature control systems.
(b) State the importance of control systems in industrial scenario.

Code: 9A03704

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

INSTRUMENTATION AND CONTROL SYSTEMS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Explain about any five static and dynamic characteristics of the general instrumentation system.
(b) Discuss about accuracy and precision in detail.
(c) Differentiate measured value (vs) true value.
- 2 Compare the resistance property in displacement and temperature measurement.
- 3 (a) Explain the role of manometers in pressure measurement.
(b) How the low pressure in a container/pipe line is measured? Explain with neat diagram.
- 4 (a) Explain how turbine flow meter is functioning in flow measurement.
(b) Can the capacitive principle be used in level measurement? How?
- 5 (a) In vibration measurement, explain the role of vibrometer with neat sketch.
(b) How the speed is measured with the help of mechanical tachometer? Explain with sketch.
- 6 (a) What is the difference between single strain gauge and strain gauge rosettes? Compare and discuss.
(b) How the resistance strain gauge is functioning?
- 7 (a) Explain the principle of operation of sling psychrometer with neat sketch.
(b) How the force is measured by means of elastic force meters?
- 8 (a) Discuss the role of servo mechanisms in speed control with neat diagram.
(b) Mention any two practical applications for open loop and closed loop control system.

Code: 9A03705

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

ENTREPRENEURSHIP
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Define the term entrepreneur and distinguish it from manager.
(b) Discuss the opportunities for entrepreneur in India.
- 2 What are the external and internal problems in new venture? Enlist the problems encountered by small scale industries.
- 3 (a) Why to have a business planning?
(b) Describe the format of business plan and its duration.
- 4 What is venture capital? Describe the various features of venture capital in India.
- 5 Discuss the following strategies for entrepreneur to grow his/her business.
 - (a) Grow organically.
 - (b) Grow through acquisitions.
 - (c) Aggressively create and leverage joint ventures and strategic partnerships, and embrace competition.
- 6 (a) How the plant layouts are related to type of production?
(b) How the government policy affects the selection of facility location?
- 7 (a) What is the purpose of inventory control and discuss its role in small scale business?
(b) What are the reasons for replacement of machines? Explain the types of maintenance of machines.
- 8 Describe the rapid internationalization among entrepreneurial firms in south Asia.

Code: 9A03705

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

ENTREPRENEURSHIP
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 Describe the role of entrepreneur in the economic development of a country.
- 2 Discuss the factors to be considered in selection of a product in product planning.
- 3 (a) Explain how to use and implement the business plan. Why some business plans fail?
(b) Describe the role of marketing research in determining market strategy for the marketing plan.
- 4 (a) Emulate the distinctive features of types of industrial finance.
(b) Discuss aspects of e-commerce and starting an e-commerce business.
- 5 Explain how to initiate, build and maintain a successful joint venture.
- 6 Discuss the location factors that influence the revenues and costs of business in rural and urban areas.
- 7 (a) Discuss the principles of material handling in small scale industry.
(b) Explain the functions of marketing and bring out the significations of market segmentation.
- 8 Discuss the aspects of entrepreneurial, market and learning orientations of international entrepreneurial business venture.

Code: 9A03705

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

ENTREPRENEURSHIP
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) "An integrated approach is necessary for making the movement of women entrepreneurship a success". Discuss.
(b) Discuss ethics and social responsibility of entrepreneurs.
- 2 Explain the points to be considered for starting a new venture.
- 3 Discuss the various sources of new ideas and the methods of generating ideas for starting a new venture.
- 4 (a) Enumerate the various sources from which an entrepreneur can raise funds.
(b) "Venture capital plays a crucial role in fostering industrial development by exploring vast and untapped potentialities". Discuss.
- 5 (a) Define acquisitions. What are advantages and disadvantages of acquisition?
(b) What are different types of franchises? Write the steps in evaluating a franchise opportunity.
- 6 (a) Explain why facility location decisions are important to the business.
(b) What are the factors that influence the selection of location for a business?
- 7 (a) How to price products and services in a small scale business? Explain basic guidelines for successful pricing strategy.
(b) What factors should be taken into account in choosing the best distribution channel?
- 8 'Small scale business firms are increasingly active in international markets'. Discuss.

Code: 9A03705

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

ENTREPRENEURSHIP
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 Define an entrepreneur and bring out his/her functions and characteristic features.
- 2 How entrepreneur's co-ordination, risk-taking and innovation actually affect their starting and nurturing businesses? Explain them.
- 3 'Business plan is a ladder for success and financing a new venture'. Discuss.
- 4 (a) How do venture capital funds invest? Discuss the forms of venture capital available in India.
(b) 'Venture capital has made significant contributions to technological innovations and promotion of entrepreneurship'. Discuss.
- 5 (a) What are the reasons for joint venture? Explain the factors in joint venture success.
(b) Discuss the aspects of e-commerce and starting e-commerce business.
- 6 Explain the various issues related to selection of facility location and layout for a business.
- 7 (a) Discuss the importance of product pricing in a small scale industry.
(b) Why marketing distribution channel is important? Discuss indirect and direct marketing distribution channels.
- 8 Define international entrepreneurship. Discuss the internationalization strategies of small scale enterprise.

Code: 9A03707

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

MECHATRONICS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 Define graphical user interface and real time control system. Discuss its applications and limitations.
- 2 What is a notch filter? Explain its operation with help of a neat circuit diagram.
- 3 What is timing belt? When the timing belts are used?
- 4 What is meant by active pull-down in a TTL circuit? Explain the performance improvements obtained by using active pull down.
- 5 Draw a circuit diagram representing DC servo motor and state its principle of working.
- 6 What is successive approximation type ADC? Explain its principle and draw its block diagram.
- 7 Develop a program for the conveyor in the last case we will add a sorting system. Gages have been attached that indicate good or bad. If the part is good, it continues on. If the part is bad, we do not want to delay for 2 seconds, but instead actuate a pneumatic cylinder.
- 8 Explain basic principle, construction and working of absolute and incremental encoder used for speed measurement.

Code: 9A03707

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

MECHATRONICS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 Explain in detail about real – time simulation with suitable example.
- 2 Design a low pass filter at a cut off frequency off frequency of 15.9 KHz with a pass band gain 1.5.
- 3 Differentiate between pneumatic and electro-pneumatic systems and explain with suitable example.
- 4 What is meant by a circuit breaker? Discuss the phenomenon of arc formation in a circuit breaker.
- 5 Explain the operation of a full step stepper motor with a neat sketch.
- 6 With a neat circuit diagram explain the functioning of an inverted R-2R ladder type digital to analog converter.
- 7 Develop a program for the basic requirements are; (i) A toggle start switch (TSI) and a limit switch on a safety gate (LSI) must both be on before a solenoid (SOLI) can be energized to extend a stamping cylinder to the top of a part. (ii) While the stamping solenoid is energized, it must remain energized until a limit switch (LS2) is activated. This second limit switch indicates the end of a stroke. At this point the solenoid should be de-energized, thus retracting the cylinder. (iii) When the cylinder is fully retracted a limit switch (LS3) is activated. The cycle may not begin again until this limit switch is active. (iv) A cycle counter should also be included to allow counts of parts produced. When this value exceeds 5000 the machine should shut down and a light lit up. (v) A safety check should be included. If the cylinder solenoid has been on for more than 5 seconds, it suggests that the cylinder is jammed or the machine has a fault. If this is the case, the machine should be shut down and maintenance light turned on.
- 8 Differentiate between P and PID controls used in closed loop control systems.

Code: 9A03707

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

MECHATRONICS
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 Explain in detail about model based and adaptive control systems.
- 2 For the circuit shown in the figure 1. Determine the lower cut off frequency and then plot the frequency response of the filter. Comment on the order of the filter from the frequency response.

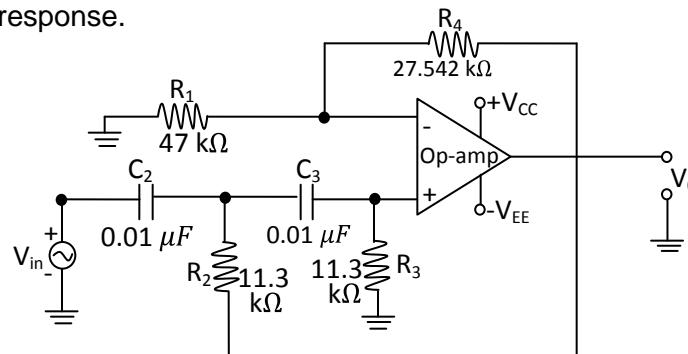


Figure 1.

- 3 A hydraulic press is used to emboss a metallic component by a double – acting cylinder. The cylinder advances and embosses the component when push button is operated. The retraction of the cylinder is effected when the piston rod is fully extended and a preset pressure is reached. Design the pneumatic circuit for the application given.
- 4 Give a detailed account on biasing depletion and enhancement MOSFETs.
- 5 Explain in detail about direct vector control scheme.
- 6 Draw the architecture of an 8051 micro controller and explain.
- 7 Develop a ladder program for used with a solenoid valve controlled double-acting cylinder, i.e. a cylinder with a piston which can be moved either way by means of solenoids for each of its two positions, and which moves the piston to the right, holds it there for 2s and then returns it to the left.
- 8 Define and explain the following terms:
 - (a) Characteristic equation.
 - (b) Order of a transfer function.

Code: 9A03707

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

MECHATRONICS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 What is the difference between hard and soft real-time systems? Explain with suitable scenario.
- 2 Design a high pass filter at a cut off frequency 1 KHz with a pass band gain of 2. Plot its frequency response.
- 3 A work-piece is pushed into position by cylinder A and is clamped by cylinder B. The clamping is achieved at present pressure. Design the pneumatic circuit for the application given.
- 4 What is the necessity of separate interfacing circuit to connect CMOS gate to TTL gate? Draw the interface circuit and explain the operation.
- 5 What is pulse width modulation? Describe with a diagram.
- 6 Explain timers and its modes, interrupts structure of 8051.
- 7 Develop a program for a conveyor is run by switching on or off a motor. We are positioning parts on the conveyor with an optical detector. When the optical sensor goes on, we want to wait 1.5 seconds, and then stop the conveyor. After a delay of 2 seconds the conveyor will start again. We need to use a start and stop button – a light should be on when the system is active.
- 8 Explain in detail about digital PI control algorithm with suitable system.
