

FACULTY OF ENGINEERING
M.E.(Civil-SE) II Semester (AICTE) (Main & Re-Registered Students)
Examination, October 2021

Subject: Structural Dynamics

Time: 2 Hours

Max. Marks: 70

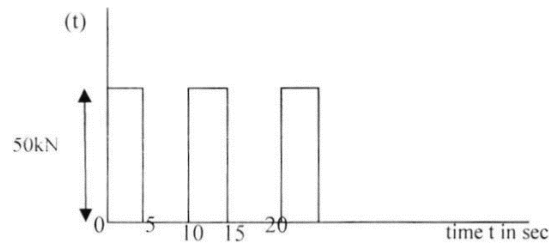
- Note:**
- i) First Question is compulsory. Answer any three questions from the remaining six questions.
 - ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.
 - iii) Missing data, if any, may suitably be assumed.

- 1 Answer any four questions from the following: (4x4 =16 Marks)**
- (a) Justify why under damped structure is preferred in comparison with over damped structure.
 - (b) Derive expression to calculate deflection when a SDOF system subjected to triangle wave impulse.
 - (c) What is dynamic Magnification Factor?
 - (d) Explain steps involved in Newmark's Average acceleration method.
 - (e) A diesel engine generator of mass 1000 kg is mounted on springs with total stiffness 500 kN/m. If the period of oscillation is 0.25 s. determine the damping coefficient c and damping factor ρ em.
 - (f) State the salient features of the transmissibility curves.
 - (g) State the various design methods adopted in seismic analysis of structures.
- 2**
- (a) The undamped spring-mass system has a mass of 6 kg and a spring stiffness of 4500N/m. It is excited by a harmonic force having an amplitude $F_0=200\text{N}$ and an excitation frequency of $\omega =15 \text{ rad/s}$. The initial conditions are $x(0) =0.02\text{m}$ and $v(0) =0.2 \text{ m/s}$. Determine (a) the frequency ratio (b) the amplitude of the forced response (c) the displacement of the mass at time $t =1.5 \text{ s}$. and (d) the velocity of mass at time $t=3\text{s}$. (9)
 - (b) An initial displacement of 20mm is imparted on an SDOF system with a mass of 4kg and stiffness of 3600N/m. If the response after eight cycles is found to be 4mm, obtain
 - (a) Damped and undamped natural frequencies
 - (b) Damping ratio
 - (c) Coefficient of viscous damping and
 - (d) Displacement at $t=0.1 \text{ sec}$. (9)
- 3**
- (a) An SDOF system consists of a mass of 20 kg, spring of stiffness 2.2 KN/m and a dash pot with a damping co-efficient of 60 N-s/m is subjected to a harmonic excitation of $F = (200 \sin 5t) \text{ N}$. show the complete solution of the equation of motion. (9)
 - (b) An air blower of mass 500kg is subjected to a disturbing force of 2.1 kN at a frequency of 1440 rpm. The blower is mounted on springs with a static deflection of 4mm. If the damping factor is 0.2, determine the amplitude of motion. (9)
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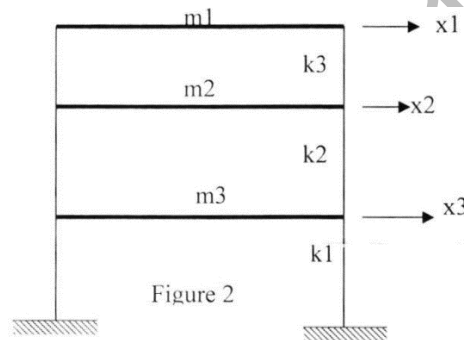
- 4 An SDOF system is subjected to a periodic load as shown in figure write down the expression for displacement considering three terms of Fourier series if damping ratio is 0.05 , $m=3 \times 10^5 \text{ kN-sec}^2/\text{m}$ and $k=2 \times 10^6 \text{ kN/m}$.

(18)



- 5 For the 3_DOF system shown in figure 2 determine the dynamic displacement if $K_1=2$, $k_2=3$, $k_3=2 \times 10^8 \text{ kN/m}$, $m_1=10^6 \text{ kN-sec}^2/\text{m}$, $m_2=2.0 \times 10^6 \text{ kN-sec}^2/\text{m}$ and $m_3=2.5 \times 10^6 \text{ kN-sec}^2/\text{m}$.

(18)

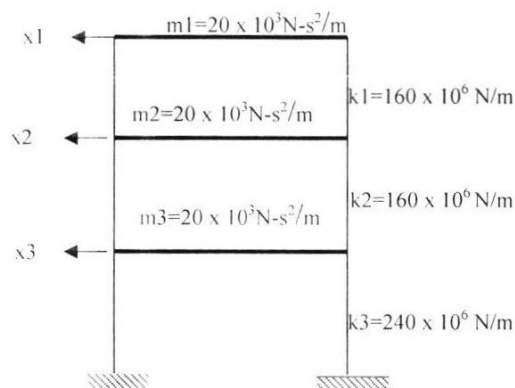


The initial conditions of vibrations at time t for the system may be taken as

$$x(0) = \begin{bmatrix} 0.5 \\ 0.4 \\ 0.3 \end{bmatrix} m \quad \dot{x}(0) = \begin{bmatrix} 0 \\ 5 \\ 0 \end{bmatrix} m/\text{sec}$$

- 6 The mass and stiffness properties of a three story shear building has Rayleigh damping. Evaluate a damping matrix for the structure which will provide 5% and 8% damping ratios in the first and second modes respectively. Compute damping ratio for third mode.

(18)



.....3

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7 For R C (special moment resisting frame conforming to ductile detailing requirements) for office (importance factor=1) the seismic weights on the floor are W_1 (roof)=3000kN, $W_2=W_3= W_4=4000$ kN. The storey heights are ground storey=4.0m and first, second and third storey=3.2m. The building is founded on hard soil and situated in zone IV. The first three natural periods are $T_n=[0.86, 0.265, 0.145]$, the first three mode shapes are $[\varphi_1]= [1.00,0.904,0.716, 0.44]$, $[\varphi_2]= [1.00,0.216, -0.701, -0.921]$, $[\varphi_3]= [1.00, -0.831, -0.574, 1.061]$ from free vibration. Determine the seismic forces by dynamic analysis procedure. (18)

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FACULTY OF ENGINEERING
M.E. (Civil-SE) II Semester (AICTE) (Main & Re-Registered Students)
Examination, October 2021

Subject: Advanced Solid Mechanics

Time: 2 Hours

Max. Marks: 70

- Note: i) First Question is compulsory. Answer any three questions from the remaining six questions.**
- ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.**
- iii) Missing data, if any, may suitably be assumed.**

- 1 Answer any four questions from the following. (4 x 4 = 16 Marks)**
- (a) Differentiate between Surface force and body force.
 - (b) Define and derive the equation of mean stress.
 - (c) Write strain-displacement relationship for a 3 dimensional Cartesian coordinate element.
 - (d) What is meant by axi-symmetric problem?
 - (e) Express stress components in terms of Airy's stress function in Polar Coordinate system.
 - (f) Derive the relation between three direction cosines.
 - (g) State the advantage of numerical approaches over traditional approaches.
- 2**
- (a) Derive compatibility equations for 3 D Cartesian element in terms of stress components. (9)
 - (b) A rectangular bar of metal of cross section of 35X55 mm is subjected to an axial tensile force of 200kN. Calculate the normal, shear and resultant stresses on a plane whose normal has the following direction cosines: (i) $l = \sqrt{3}/2$; $m = 1/\sqrt{2}$; $n = 1/\sqrt{2}$ (ii) if the plane is octahedral plane. (9)
- 3**
- (a) A 3D element has the same boundary conditions on any given cross section, leading to the following stress function

$$(\phi = 15x^5 - 4xy^4 + 4x^3y^2 + 5x^2y^3)$$
 - (i) Check whether it is a valid stress function
 - (ii) Calculate the all stress components resulting from above stress function (use $\mu = 0.25$)
 - (iii) Calculate strain components. (9)

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- (b) For the three dimensional state of stress, the stress functions ϕ_1, ϕ_2, ϕ_3 are defined as:

$$\sigma_x = \frac{\partial^2 \phi_3}{\partial y^2} + \frac{\partial^2 \phi_1}{\partial z^2} ; \quad \sigma_y = \frac{\partial^2 \phi_1}{\partial z^2} + \frac{\partial^2 \phi_3}{\partial x^2} ;$$

$$\sigma_z = \frac{\partial^2 \phi_3}{\partial y^2} + \frac{\partial^2 \phi_1}{\partial z^2} ; \quad \tau_{xy} = -\frac{\partial^2 \phi_3}{\partial x \partial y} ;$$

$$\tau_{yz} = \frac{\partial^2 \phi_1}{\partial y \partial z} ; \quad \tau_{zx} = \frac{\partial^2 \phi_2}{\partial z \partial x} ;$$

Show that they satisfy the equilibrium equations. Determine six compatibility equations resulting from given stress field. (9)

- 4 (a) Explain the bending phenomenon of a simply supported beam subjected to u.d.l. 'w' throughout the span 'l' (9)
 (b) The displacement field in a body is defined as: $u_x = (x^2+3) \times 10^{-3}$; $u_y = (3y^2z+3) \times 10^{-3}$; $u_z = (x+3y) \times 10^{-3}$. Determine the (i) strain components (ii) Stress components (iii) Mean stress (iv) Octohedral shear stress at a point whose co-ordinates are (1,2,4). (9)
- 5 (a) Explain the effect of circular hole of diameter 'b' on stress distribution in a square plate of side 'a' subjected to tension 'S' at the ends. (9)
 (b) Derive Stresses due to load at a point on a semi-infinite straight boundary. (9)
- 6 (a) Prove that cross sectional asymptotes of elliptical cross sectioned shaft of major axis '2a' and minor axis '2b' changes to hyperbolas after application of twisting moment 'T' at the ends. (9)
 (b) Explain Torsion phenomenon of a bar of narrow rectangular bars. Also determine the expression for maximum shear stress. (9)
- 7 (a) Explain State Saint-Venant's principle. Also explain uniqueness of this solution. (9)
 (b) Explain the importance of principle of superposition. Also explain reciprocal theorems. (9)

FACULTY OF ENGINEERING

**M.E. (Civil-TE) II-Semester AICTE (Main & Re-Registered Students)
Examination, October 2021**

Subject: DESIGN OF HIGHWAY INFRASTRUCTURE

Time : 2 Hours

Max. Marks: 70

Note: (i) First question is compulsory and answer any three questions from the remaining six questions.

(ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.

(iii) Missing data, if any, may suitably be assumed.

- 1 Answer any four questions from the following : (4x4=16M)**
- What is the significance of Design speed in Geometric design of Highways?
 - Calculate the safe stopping distance for a vehicle travelling at 80 kmph on an upward gradient of 2 percent? Assume coefficient of friction as 0.3
 - What is momentum gradient? Where it is provided?
 - What are the principles of intersection design?
 - Describe the importance of Traffic impact attenuators?
 - Calculate the stopping sight distance on a National Highway in rolling terrain at an ascending gradient of three percent? Assume missing data as per IRC standards.
 - What are the requirements of pedestrians in arterial roads?
- 2 (a) What is the significance of driver characteristics in geometric design of Highways? Briefly discuss the factors which affect the driver characteristics and their effects on traffic performance? (9M)**
- (b) What is the importance of pavement roughness? How pavement roughness is measured? (9M)**
- 3 (a) A valley curve is formed by a descending grade of 1 in 20 meeting a rising grade of 1 in 30. Design the length of valley curve to be comfortable as well as to leave adequate head light sight distance at a speed limit of 70 Kmph? Admissible rate change of centrifugal acceleration for comfort can be taken as 0.5m/sec^2 the reaction time 2.5 sec, coefficient of friction 0.35. Head light above ground as 0.7m, beam angle as 2° upward. (9M)**

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- (b) Discuss the factors to be considered while designing the length of transition curves? (9M)
- 4 (a) Explain briefly various design factors are to be considered in rotary intersection design? (9M)
- (b) Explain grade separated intersection, the advantages and limitations? (9M)
- 5 (a) Classify different types of traffic signs and mention the objectives of each type of signs; with sketches show the general shape of these types of signs? (9M)
- (b) What is the necessity of Delineation? Explain broad types of delineators? (9M)
- 6 (a) Explain the guidelines and design standards for the provision of foot over bridges. (9M)
- (b) From an in-out survey conducted for a parking area consisting of 35 bays, the initial count was found to be 20. Table gives the result of the survey. The number of vehicles coming in and out of the parking lot for a time interval of 5 minutes is as shown in the table. Find the accumulation, total parking load, average occupancy and efficiency of the parking lot? (9M)

Time	5	10	15	20	25	30	35	40	45	50	55	60
In	3	5	6	3	4	7	5	2	3	4	2	4
Out	2	3	2	1	3	4	1	6	3	2	0	2

- 7 Write short notes on the following:
- (a) Vehicle Characteristics (7M)
- (b) Road markings (7M)
- (c) Subways. (4M)

FACULTY OF ENGINEERING**M.E. (Civil-CM) II-Semester (AICTE) (Main & Re - Registered Students)****Examination, October 2021****Subject: Quantitative Methods in Construction Management****Time : 2 Hours****Max. Marks : 70**

Note : i) **First Question is compulsory and answer any three questions from the remaining six questions.**

ii) **Answers to each question must be written at one place only and in the same order as they occur in the question paper.**

iii) **Missing data, if any, may suitably be assumed.**

1. Answer any Four Questions from the following (4 X 4 = 16Marks)

- a) Discuss the scope of Operation Research in the field of construction management?
- b) List out the various characteristics of standard and canonical form of LPP?
- c) How do you identify the optimum solution in the Simplex method?
- d) Write the general formulation of assignment problem using sigma sign?
- e) State Bellman's principle of optimality?
- f) What is simulation? List out the various advantages of simulation?
- g) How does the direct and indirect cost of a project affects the overall cost of a project in the process of crashing the network?

2. a) Explain the necessary and sufficient conditions for the solution of a general problem by Lagrange multiplex method? 6

b) Find all the basic solutions to the following problem

$$\text{Maximize } Z=5x_1 + 2x_2 + x_3$$

$$\text{Subject to } 3x_1 + 2x_2 + 3x_3 = 9$$

$$6x_1 + 3x_2 + 5x_3 = 5$$

Also find which of the basic solutions are (i) basic feasible (ii) non degenerate basic feasible (iii) optimal basic feasible 12

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3. Solve the following LPP using Big M – method 18

$$\text{Maximize } Z = x_1 + 2x_2 + 3x_3 - x_4$$

$$\text{Subject to } x_1 + 2x_2 + 3x_3 = 15$$

$$2x_1 + x_2 + 5x_3 = 20$$

$$x_1 + 2x_2 + x_3 + x_4 = 10$$

4. Find the optimum solution to the following transportation problem in which the cells contain the transportation cost in rupees. 18

	D1	D2	D3	D4	D5	Available
S1	7	6	4	5	9	40
S2	8	5	6	7	8	30
S3	6	8	9	6	5	20
S4	5	7	7	8	6	10
Required	30	30	15	20	5	

5. a) What is degeneracy and non degeneracy in transportation problem and how they are resolved? 6
- b) Consider the problem of assigning five operators to five machines. The assignment costs are given below. Find the optimal Solution. 12

	OPERATORS				
	II	II	III	IV	V
A	10	5	13	15	16
B	3	9	18	3	6
C	10	7	2	2	2
D	5	11	9	7	12
E	7	9	10	4	12

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6. a) List out the various characteristics of Dynamic Programming? 6
 b) How the stage coach problem is optimized by making use of dynamic programming? 12
- 7 a) What do you understand by decision theory? Explain in detail the various steps involved in decision theory approach? 7
 b) Determine the optimum project duration and cost for the following data 11

Activity	Normal		Crash	
	Time(days)	Cost (Rs)	Time (days)	Cost (Rs)
1-2	8	100	6	200
1-3	4	150	2	350
2-4	2	50	1	90
2-5	10	100	5	400
3-4	5	100	1	200
4-5	3	80	1	100

FACULTY OF ENGINEERING

**M.E. (EEE-PE) II-Semester (AICTE) (Main & Re-Registered Students)
Examination, October 2021**

Subject: Power Electronics Applications to Renewable Energy

Time: 2 Hours

Max. Marks: 70

Note: (i) First question is compulsory and answer any three questions from the remaining six questions.

(ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.

(iii) Missing data, if any, may suitably be assume.

1 Answer any four questions from the following: (4x4=16M)

- (a) List different types of renewable energy sources.
 - (b) Write the advantages and disadvantages of Boost convertor.
 - (c) List the issues related to grid connection
 - (d) Draw the P-V and I-V characteristics of PV module.
 - (e) List different types of generators for wind energy conversion
 - (f) Explain about AC microgrid.
 - (g) Define Photovoltaic Effect.
- 2(a) Explain the effect of temperature, Insolation, Shading on PV cells (9M)
 (b) What is MPPT? Explain in detail. (9M)
- 3(a) Explain different types of DC –DC converters for Solar PV systems. (9M)
 (b) Explain the concept of Interleaved converters. (9M)
- 4(a) Discuss various control schemes for grid connected converters. (9M)
 (b) Explain in detail about multilevel neutral point clamped converter. (9M)
- 5(a) Briefly explain the characteristics of wind energy systems. (9M)
 (b) Explain about power extraction and MPPT techniques for wind energy systems. (9M)
- 6(a) Explain about DC generator with DC-AC converters in wind energy systems. (9M)
 (b) Write the factors affecting the battery performance. (9M)
- 7(a) Write short notes on permanent magnet based generators. (9M)
 (b) Explain the operation of doubly fed induction generator with a neat sketch. (9M)

FACULTY OF ENGINEERING

**M.E.(EEE-PES) II-Semester (AICTE)(Main &Re-Registered Students)
Examination, October 2021**

Subject: Static Control of AC Drives

Time: 2 Hours

Max. Marks: 70

Note: (i) First question is compulsory and answer any three questions from the remaining six questions.

(ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.

(iii) Missing data, if any, may suitably be assume.

1 Answer any four questions from the following: (4x4=16M)

- (a) What is static rotor resistance control of induction motor?
 - (b) Differentiate between stepped and pWM inverters.
 - (c) List the advantages and disadvantages of VSI over CSI fed induction motor.
 - (d) Draw the harmonic equivalent circuit of induction motor.
 - (e) Define vector control of induction motor. List the different vector control techniques.
 - (f) What do you mean by separate control of synchronous motor? How is it different from self-control?
 - (g) Give the applications of stepper motor.
- 2(a) What do you mean by slip power recovery schemes? Explain the operation of static Scherbius drive in detail. Derive the relevant equations. (9M)
- (b) A 440V, 50Hz, 6-pole Y-connected wound rotor Induction Motor has $R_s=0.5\Omega$, $R_r'=0.4\Omega$, $X_s = X_r' = 1.2\Omega$, $X_m = 50\Omega$. Motor is controlled by static rotor resistance control. If the stator to rotor turns ratio as 3.5 calculate the value of external resistance such that the breakdown torque is produced at standstill for a duty ratio of zero. (9M)
- 3(a) Explain the effects of Harmonics on the performance of induction motor. Draw its equivalent circuit. (9M)
- (b) Explain the operation of VSI fed induction motor drive. (9M)
- 4(a) Explain the principle of vector control using neat block diagram. (8M)
- (b) Explain the operation of direct vector control used in the control of induction motor. (10M)
- 5(a) Explain the operation of cyclo converter fed self-control of synchronous motor. (9M)
- (b) Explain the control of synchronous motor employing a load commutated inverter in detail. (9M)

- 6(a) Explain the operation of 4 phase 8/6 pole switched reluctance motor with neat schematic and waveforms. (9M)
- (b) Explain the operation and drive characteristics of permanent magnet stepper motor. (9M)
- 7(a) Explain the operation of CSI fed synchronous motor drive. (9M)
- (b) Explain the principle of operation and working of brushless DC motor with neat sketch and waveforms. (9M)

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FACULTY OF ENGINEERING

M.E. (ECE-DS) II-Semester (Main & Re-Registered Students) AICTE

Examination, October 2021

Subject: Digital Signal Processors

Time : 2 Hours

Max. Marks: 70

Note: (i) First question is compulsory and answer any three questions from the remaining six questions.

(ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.

(iii) Missing data, if any, may suitably be assume.

1 Answer any four questions from the following: (4x4=16M)

- (a) Compare Fixed and Floating point representation formats.
 - (b) State Twiddle factor/Phase factor properties.
 - (c) Classify Addressing modes of DSP processors.
 - (d) Draw and explain Barrel shifter.
 - (e) Explain Bit Reversed Addressing mode of TMS320CS4XX processor.
 - (f) Explain Pipelining concept in DSP.
 - (g) Explain Interrupts and I/O.
-
- 2(a) Compute DFT of the sequence $x(n) = [1, 2, 3, 4, 5, 6, 7, 8]$ using DFT-FFT algorithm. (12 M)
- (b) Compute FIR and IIR filters. (6 M)
- 3(a) Explain A/D conversion error in DSP implementation (12M)
- (b) Explain Block floating point format. (6 M)
- 4(a) Explain Special Addressing Modes in detail. (10M)
- (b) Explain speed Issues in programmable DSP. (8 M)
- 5(a) Draw and explain the Architecture of TMS320C54XX processor with a neat diagram. (12M)
- (b) Explain MAC unit. (6M)
- 6(a) Explain Memory space organization in programmable DSP. (10M)
- (b) Explain CODEC-DSP interface. (8M)
- 7(a) Explain pipelining and on-chip peripherals in DSP processor in detail. (12M)
- (b) Explain Warping effect in IIR filters. (6M)

FACULTY OF ENGINEERING**M.E. (ECE-ES) II-Semester (AICTE) (Main & Re-Registered students)****Examination, October 2021****Subject: IoT Applications and Communication Protocols****Time: 2 Hours****Max. Marks: 70****Note: (i) First question is compulsory and answer any three questions from the remaining six questions.****(ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.****(iii) Missing data, if any, may suitably be assume.**

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- 1 **Answer any four questions from the following: (4x4=16M)**
- What is the difference between RFDs and FFDs?
 - What is Beaglebone?
 - What is Modbus?
 - What is the basic difference between LOS and NLOS?
 - How do IoT devices communicate?
 - What do you mean by data acquisition?
 - Write few examples of Mobile cloud Platforms?
- 2
- Explain the basic factors to be considered for selecting a sensor for Industrial Applications? 9M
 - Discuss in detail about the different IoT enabled Solutions for Healthcare and Smart Cities? 9M
- 3
- Explain in detail about Primary and Secondary calibration techniques? 9M
 - Write short notes on:
 - Sensor Body
 - Sensor Mechanism
 - Sensor Maintenance
 9M
- 4
- Discuss about different powering options for sensors and IoT? 9M
 - Write short notes on different Zigbee Chips? 9M
- 5
- Discuss in detail about the differences between FPGA and ASIC design? 9M
 - Discuss the features of an Arduino and Important parts? 9M
- 6
- Explain IoT cloud-based services using the Xively? 9M
 - Compare the Main characteristics of M2M and IoT? 9M
- 7
- Discuss the various Sensors, RF Modules, Preferable Network topology required for home Automation system? 9M
 - An industry site is located 5kms away from the office at NLOS location. The Manager 9M

FACULTY OF ENGINEERING**M.E (ECE-ES&VLSI,ES&VLSI D) II-Semester (AICTE)****(Main&Re-Registered Students) Examination, October 2021****Subject: REAL TIME OPERATING SYSTEMS****Time: 2 Hours****Max. Marks: 70**

Note: (i) First question is compulsory and answer any three questions from the remaining six questions.

(ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.

(iii) Missing data, if any, may suitably be assume.

- 1 Answer any four of the following questions: (4x4=16M)**
- (a) Discuss about UNIX signals
 - (b) Explain about a job and a process with the help of examples
 - (c) Define Context switching
 - (d) Summarize the features of V_x Works
 - (e) Discuss about IDE
 - (f) What is a critical task
 - (g) Explain the round robin scheduling algorithm
- 2**
- (a) Explain about the layered architecture of OS (9M)
 - (b) Briefly discuss about the file system calls of Unix operating system (9M)
- 3**
- (a) Explain about EDF algorithm with the help of Gantt charts? Differentiate between RMS and EDF algorithms (12M)
 - (b) Differentiate between hard and soft real time systems (6M)
- 4**
- (a) Explain priority inversion problem? Discuss how it can be avoided (10M)
 - (b) What is a reentrant function? What are the conditions required to make the code reentrant? (8M)
- 5**
- (a) Describe the task state and task transition diagram in V_x Works (8M)
 - (b) Discuss about memory management in V_x Works (10M)
- 6**
- (a) Explain about In-Circuit Emulator (9M)
 - (b) Discuss about Logic analyzer (9M)
- 7**
- (a) Describe about POSIX standards (9M)
 - (b) Compare pre-emptive and non-preemptive scheduling. (9M)

FACULTY OF ENGINEERING

M.E. (Mech-Cad/Cam) II-Semester (Main & Re - Registered Students) (AICTE)

Examination, October 2021

Subject : FINITE ELEMENT TECHNIQUES

Time: 2 hours

Max. Marks: 70

Note: i) First Question is compulsory and answer any Three questions from the remaining six questions.

ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.

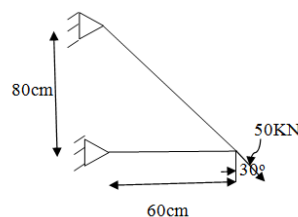
iii) Missing data, if any, may suitably be assumed.

1. Answer any Four Questions from the following (4 X 4 = 16Marks)

- a) Sketch truss, beam and frame elements.
- b) Distinguish between sub parametric, super parametric and iso-parametric element.
- c) What are the types of boundary conditions imposed in heat transfer problem?
- d) Distinguish between essential and natural boundary conditions.
- e) Derive the relation between global and natural coordinates for a 1-D element.
- f) Derive the material matrix $[D]$ for a 3D element.
- g) List the FEA software's used for stress analysis and heat transfer analysis.

2. Derive the shape functions and element stiffness matrix for one dimensional bar element from first principle. 18

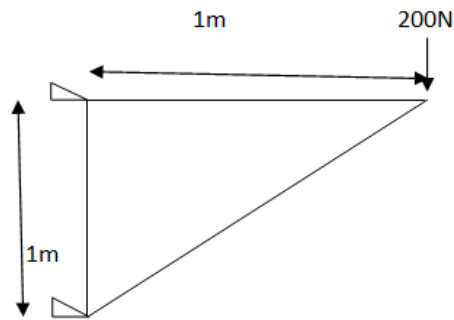
3. a) Calculate the nodal displacements, stresses and support reactions in the truss shown in Figure $E= 20 \times 10^6 \text{N/cm}^2$. 12



b) Derive the transformation matrix for an inclined member of truss element. 6

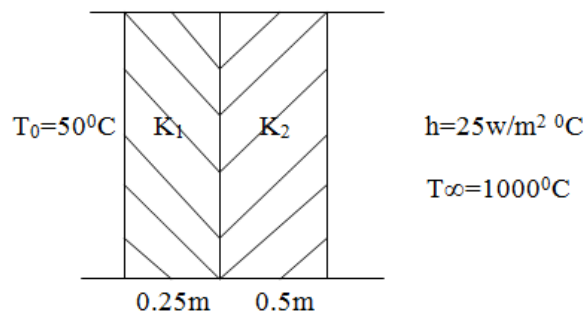
4. a) For the two dimensional loaded plate shown in figure write the element stiffness matrix, thickness=1 mm, $E=100 \text{ Gpa}$, $\nu=0.3$ 12

..2



b) Write shape functions of a constant strain triangle (CST) element. 6

5. A composite wall consists of two materials as shown in figure 3. The outer temperature is $T_0 = 50^\circ\text{C}$, convection heat transfer takes place on the inner surface of the wall with $h = 25\text{W/m}^2\text{ }^\circ\text{C}$ and $T_\infty = 1000^\circ\text{C}$. Determine the temperature distribution in the wall. The Properties are $k_1 = 50\text{W/m }^\circ\text{C}$, $k_2 = 25\text{W/m }^\circ\text{C}$. 18



6. a) Explain the concept of time dependent field problem applied to one dimension heat flow. 12
- b) Derive the material matrix $[D]$ for a 3D element. 6
7. a) Derive the material matrix for plain stress and plain strain conditions 9
- b) List the FEA software's used for stress analysis and heat transfer analysis along with salient features of each. 9

FACULTY OF ENGINEERING**M.E. (Mech-CAD/CAM) II-Semester (AICTE) (Main & Re-registered students)****Examination, October 2021****Subject: Computer Integrated Manufacturing****Time: 2 Hours****Max. Marks: 70****Note: (i) First question is compulsory and answer any three questions from the remaining six questions.****(ii) Answer to each question must be written at one place only and in the same order as they occur in the question paper.****(iii) Missing data, if any, may suitably be assume.**

1 Answer any four questions from the following: (4x4=16M)

- (a) What are the benefits of CIM?
 - (b) Distinguish between Sequential and Concurrent engineering.
 - (c) What are the advantages of PDM?
 - (d) What are the requirements of data base?
 - (e) What is LAN, MAN, WAN?
 - (f) List the characteristics of Lean manufacturing.
 - (g) What are the different types of waste in lean manufacturing?
- 2 (a) With neat diagram explain CASA-SME CIM WHEEL. (9M)
- (b) What are the benefits and characteristics of concurrent engineering? (9M)
- 3 (a) Mention the reasons behind need of a DBMS for a manufacturing company? (9M)
- (b) What are different types of database models? Explain RDBMS with an example. (9M)
- 4 (a) Explain about the transfer lines with no internal parts storage. (9M)
- (b) Explain different methods of work part transfer mechanism. (9M)
- 5 (a) With a neat diagram explain the working of Siemens, ESPRIT-OSA, and IBM concepts of CIM. (9M)
- (b) What is network topology? With a neat diagram, explain various types of network topologies. (9M)

-2-

- 6 (a) Discuss about four functions of Lean Manufacturing. Mention the benefits of Lean Manufacturing. (9M)
- (b) What is Agile Manufacturing? Mention the characteristics of Agile Manufacturing, explain how it is different from Lean manufacturing. (9M)
- 7 (a) What is SQL? Give an example of the use of SQL to access a manufacturing database. (9M)
- (b) Explain various types of Network Interconnection and Devices. (9M)

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FACULTY OF ENGINEERING

M.E. (Mech-HVAC) II - Semester (Main & Re - Registered Students) (AICTE)

Examination, October 2021

Subject: HVAC Systems Design

Time: 2 hours

Max. Marks: 70

Note: i) First Question is compulsory and answer any Three questions from the remaining six questions.

ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.

iii) Missing data, if any, may suitably be assumed.

1. Answer any Four Questions from the following (4 X 4 = 16Marks)

- a) Define stack effect?
 - b) Write about sol-air temperature?
 - c) Explain Decrement factor?
 - d) What are Primary and Secondary water loops?
 - e) Explain fan laws?
 - f) What are the different types of Ventilation systems?
 - g) Write a short note on direct solar radiation?
2. a) A room is 5.5m x 3.5m x 3m high. The total perimeter of an average fit non-weather stripped window crack in the room is 10 m. The wind velocity is 9 m/s. Calculate the air-change rate of infiltration: (i) Using $\rho=1.2$, infiltration through double-hung windows in m/h/m of crack = 4 cm
(ii) Using the empirical relation for the frictional resistance to air flow $Q = 0.125 (0.64 p) L/m$ where p is in N/. 9
- b) For a 2.5 m wide and 3 m high unshaded glass window in a south-west wall, calculate the heat gain of space assuming a single vertical glass. The following data are given: Direct radiation normal to sun's rays $720 W/m^2$, Diffuse radiation $95 W/m^2$, Sun's altitude angle 60° , Solar azimuth angle 15° , west of south Outside temperature $40^\circ C$, Inside temperature $21^\circ C$, Outside surface heat-transfer coefficient $17.5 W/m^2 K$, Inside surface heat-transfer coefficient $11.5 W/m^2 K$. 9
3. a) Explain how a closed space gains heat through glass? 9
b) Explain various components in calculating winter heating load? 9
4. a) Calculate the instantaneous sol-air temperature for a wall with the following conditions: 9
Total of direct and diffuse solar radiation = $260 W/m^2$
Absorptivity of surface = 0.9
Outside surface heat-transfer coefficient = $23 W/m^2 K$
Outside air temperature = $35^\circ C$

- b) Discuss about natural ventilation through infiltration? 9
5. a) Distinguish between crack method and air change method? 9
b) Explain about infiltration due to door openings? 9
6. a) Discuss methods for vibration isolation? 9
b) Expound wall solar azimuth angle and angle of incidence? 9
7. a) Why is the effect of shading devices significant? 9
b) Explain in detail different types of air filters used in HVAC systems? 9

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FACULTY OF ENGINEERING

**M.Tech. (CSE-CSE) II-Semester (AICTE) (Main & Re - Registered Students)
Examination, October 2021**

Subject : Advanced Algorithms

Time : 2 Hours

Max. Marks : 70

- Note :**
- i) First Question is compulsory and answer any three questions from the remaining six questions.
 - ii) Answers to each question must be written at one place only and in the same order as they occur in the question paper.
 - iii) Missing data, if any, may suitably be assumed.

1. Answer any Four Questions from the following (4 X 4 = 16Marks)

- a) Explain greedy paradigm with an example?
 - b) What is an Approximation Algorithm?
 - a) How can you evaluate the performance of an algorithm? Explain the Asymptotic Notations?
 - d) What are the applications of Minimum Spanning Trees?
 - e) Explain Discrete Fourier Transform?
 - f) What is Amortized Analysis, explain with an example?
 - g) Explain the divide and conquer paradigm?
2. a) Explain the computation of strongly connected components in a directed graph? [9]
 - b) Illustrate BFS in a graph using an algorithm? [9]
 3. a) Explain the Maximum flow Minimum cut theorem with an example? [9]
 - b) Introduce the Divide and Conquer approach for matrix multiplication and explain how Strassen's algorithm reduces the time complexity? [9]
 4. a) What is a matroid? Explain the Greedy Algorithm in detail? [9]
 - b) Explain the computation of weight of a maximal independent set? [9]
 5. a) Explain any two types of sorting algorithms? [9]
 - b) Explain Floyd Warshall Algorithm with example. [9]
 6. a) Explain any two sorting techniques using the recently proposed data structures? [9]
 - b) What is NP hard problem? Give an example and a proof of it? [9]
 7. a) Give an example of Dynamic Programming? [9]
 - b) Compute the inverse of a lower triangular matrix? [9]
