ADAMAS UNIVERSITY
SCHOOL OF ENGINEERING AND TECHNOLOGY
END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Name of the Program: B.Tech   Semester: V
Stream: ME
PAPER TITLE: Kinematics and Dynamics of Machines   PAPER CODE: EME43103
Maximum Marks: 40   Time duration: 3 hours
Total No of questions: 09   Total No of Pages: 02

Answer all the Groups
Group A
(Answer all the questions)

$5 \times 1 = 5$

1. a) What is the importance of crowning of pulleys in flat-belt drives?
   b) Gyroscopic effects are null during rolling of an aeroplane. Explain.
   c) For a damped system, ratio of responses under harmonic and static excitations is always less than unity for frequency ratio greater than _____.
   d) Give the expression for both primary and secondary unbalanced forces acting on a reciprocating engine. Use proper notations.
   e) Prove that viscous damping is a type of linear damping.

Group B
*(Answer any three questions)*

$3 \times 5 = 15$

2. Four masses m_1, m_2, m_3 and m_4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45^0, 75^0 and 135^0. Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m.

3. A uniform disc of diameter 300 mm and of mass 5 kg is mounted on one end of an arm of length 600 mm. The other end of the arm is free to rotate in a universal bearing. If the disc rotates about the arm with a speed of 300 r.p.m. clockwise, looking from the front, with what speed will it precess about the vertical axis?

4. Find out the amplitude of vibration of a spring-mass-damper system supported on a base which is subjected to a harmonic excitation $y(t) = Y \sin \omega t$.

5. Elaborate the effect of centrifugal tension on power transmitted.

6. An under-damped shock absorber is to be designed for a motorcycle of mass 200 kg. The shock absorber is subjected to an initial velocity due to a road bump which causes vibration with the damped time period as 2 seconds. Amplitude of vibration reduces to $1/4^{th}$ in ½ cycle. Determine the stiffness and damping constant of the shock absorber.

Group C

(Answer any two questions)

$2 \times 10 = 20$

7. A V-belt weighing 1.6 kg/m run has an area of cross-section of 750 mm². The angle of lap is 165⁰ on the smaller pulley which has groove angle of 40⁰, μ = 0.12. The maximum safe stress in the belt is 9.5 N/mm². What is the power that can be transmitted by the belt at a speed of 20 m/s.

8. A rotating shaft carries four discs A, B, C and D in this order which are attached perpendicular to it. Their mass centers are 30 mm, 40 mm, 35 mm and 38 mm respectively from the axis of rotation. The masses A, C and D are 7.5 kg, 5 kg and 4 kg respectively. The axial distances between the planes of rotation of A and B is 400 mm and between B and C is 500 mm. The masses A and C are at right angles to each other. Find for a complete balance of the system;
    i. The angles between the mass centers of B and D from that of A,
    ii. The axial distance between the planes of rotation of C and D, and
    iii. The magnitude of mass B

9. For the turbine rotor of a ship, mass = 20,000 kg, radius of gyration = 0.75 m, and speed = 2000 rpm (clockwise when viewed from the front of the ship). The ship pitches harmonically with amplitude of 10⁰ and the time period of 20 sec. The turbine rotor is supported on bearings 5 m apart. Determine the maximum reaction force at the front bearing and its direction, when the front of the ship is rising. The CG of the rotor may be assumed to be at mid-span between the bearings.
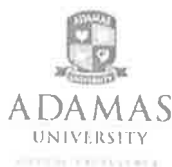
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ADAMAS UNIVERSITY
SCHOOL OF ENGINEERING AND TECHNOLOGY
END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Name of the Program: B. Tech.
Stream: EE
PAPER TITLE: **Electrical Machine Design**
Maximum Marks: 40
Total No of questions: 9

Semester: V

PAPER CODE: **EEE43103**
Time duration: 3 hours
Total No of Pages: 2

Answer all the Groups
Group A
(Answer all the questions)

$5 \times 1 = 5$

1. **a)** Why the core of a transformer generates heat during its operation ?

    b) Write down the expression for power efficiency η of a transformer. What is the condition for η to be maximum ?

    c) In a three phase slip ring induction motor, slip rings are used for what purpose ?

    d) Why oil is used in the tank of a transformer ?

    e) What is the function of fins or radiators in a transformer tank ?

Group B
(Answer any three questions)

$3 \times 5 = 15$

2. Derive the condition for designing a transformer for minimum weight.

3. Derive the output equation of a DC machine.

4. (a) What are the main differences between a distribution transformer and a power transformer?

    (b) What are the different methods for cooling of transformers? Describe briefly any two of them with diagrams.

5. Derive the condition for designing a transformer for minimum cost.

6. What is Buchholz relay? Compared to a traditional relay, why it is special? Draw a neat sketch of Buchholz relay and describe its operation.

7. (a) Derive the condition for designing a transformer for minimum loss. $5 + 5$

(b) For a three phase transformer, if A_c is the area of active copper in the window, AT is the ampere-turn and δ is the current density, show that

$$A_c = (4AT)/\delta$$

8. Determine the dimensions of core and yoke for a 200 kVA, 50 Hz single phase core type transformer. A cruciform core is used with distance between adjacent limbs equal to 1.6 times the width of largest core lamination. Assume voltage per turn to be 14 V, maximum flux density 1.1 Tesla, window space factor 0.32, current density 3 A/mm^2, and the stacking factor = 0.9. The net iron area is 0.56 d^2, where d is the diameter of circumscribing circle. Also, the width of largest stamping is 0.85 d.

9. Write short notes on:

          $5 + 5$

    (i)   Conservator

    (ii)   Breather

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END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Name of the Program: B. Tech   Semester: V
Stream: ECE
PAPER TITLE: Microwave Engineering   PAPER CODE: EEC43107
Maximum Marks: 40   Time duration: 3 hours
Total No of questions: 09   Total No of Pages: 01

DO NOT SCATTER THE ANSWERS FOR DIFFERENT PARTS OF A QUESTION.

Answer all the Groups
Group A
(Answer all the questions)

$5 \times 1 = 5$

1. a) In H-Plane Tee if the input signal is fed into port 3, what will be the nature of the output signal from port 1 & 2?

    b) Describe the condition when the characteristic impedance of a transmission line becomes a real quantity.

    c) What is the modulation technique used in Klystron amplifier?

    d) What is the angle between the direction of wave propagation and the electric field vector in TM mode?

    e) Define attenuation constant.

Group B
(Answer any three questions)

$3 \times 5 = 15$

2. Draw the equivalent circuit of a small section of a uniform transmission line. Explain the different circuit elements under consideration.   [2+3]

3. Explain the role of different components of a microwave isolator with proper diagram.   [5]

4. Describe 4-port microwave circulator.   [5]

5. What are the limitations of 2-cavity klystron amplifier?   [5]

6. Write shorts note on: (i) Magic Tee (ii) Hybrid Ring   [5]

Group C
(Answer any two questions)

$2 \times 10 = 20$

7. Define and write the expression for (i) propagation constant (ii) characteristic impedance of transmission line. Find out the values of γ and Zo under following three conditions: (i) for minimum attenuation (ii) for no loss (iii) for no distortion   [10]

8. Explain the limitation of conventional vacuum tubes in microwave amplification. Explain the working principle of 2-cavity klystron amplifiers.   [4+6]

9. Write short notes on- (a) Cylindrical Magnetron oscillator (b) Gunn Diode   [5+5]

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SCHOOL OF ENGINEERING AND TECHNOLOGY
END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Name of the Program: B. Tech.   Semester: V
Stream: CE
PAPER TITLE: Soil Mechanics II   PAPER CODE: ECE43105
Maximum Marks: 40   Time duration: 3 hours
Total No of questions: 9   Total No of Pages: 2

(IS 6403: 1981 and IS 2911 will be required)

Answer all the Groups
Group A
(Answer all the questions)

$5 \times 1 = 5$

1. a) If an anchored sheet pile retain 5 m. high sandy backfill of $\varphi = 30°$, $\gamma = 10$ kN/m^3 and embedded about 4 m. depth in a clayey deposit of $c = 15$ kN/m^2. Then, what will be the resultant Passive thrust?

   b) A 2 m wide strip footing, is placed at 1.5 m depth from G.L. Now, if the water table upto the 1 m depth from G.L., then according to IS code, calculate the reduction factor due to water table.

   c) Evaluate the Degree of saturation, S_r (in %) of a natural soil deposit having water content 15%, specific gravity 2.50 and void ratio 0.5.

   d) According to Meyerhof, for deep foundation the value of angle 'β' with horizontal, will reach upto maximum which angle?

   e) A wooden pile is driven with a drop hammer of 2 kN, having a free fall of 0.75 m. If, the penetration in the last blow is 5 mm. Then as per Engineering NEWS formula, calculate the load carrying capacity of the pile.

Group B
(Answer any three questions)

$3 \times 5 = 15$

2. Explain the difference between Free and Fixed earth support method for determining the Embedment depth of Anchored Sheet pile. Use necessary diagrams, if any.

3. Write the equations and values regarding Shape factors (*s*) of various footings, to obtain their Bearing capacity.

4. Derive the Terzaghi's bearing capacity equation for General shear failure with neat diagram.

5. Determine the depth at which a circular footing of 2 m diameter be founded, if it has to carry a safe load of 1600 kN. Use Terzaghi's analysis. Consider, the foundation soil has $c = 10$ kN/m^2, $\varphi = 30°$ and unit weight $\gamma = 18$ kN/m^3. Also take, $N_c = 37.2$, $N_q = 22.5$ and $N_\gamma = 19.7$.

[1]

6. Write short notes on the following (write any *two*):   (a) Local shear failure $2 \times 2.5 = 5$
                                                       (b) Standard Penetration test
                                                       (c) Negative skin friction
                                                       (d) Compaction pile

Group C

(Answer any two questions)

$2 \times 10 = 20$

7. Compute the embedment depth and pull in the anchor for the Anchored sheet pile as given in **Fig.1**, by fixed earth support method. The soil of the backfill and below dredge line is same and having following properties: $c = 0$ kN/m^2, $\varphi = 30°$, $\gamma_{sat} = 24$ kN/m^3 and $\gamma = 18$ kN/m^3. Consider, 'x' value equals to 0.1 H.

8. **a)** A Square footing located at a depth of 1.3 m. below the G. L. has to carry a safe load of 800 kN. Find the size of the footing if the desired factor of safety is 3. The soil has the following properties:

    $c = 8$ kN/m^2, $\varphi = 30°$, *Void ratio* = 0.55, *Degree of saturation* = 50%, *Specific Gravity* = 2.67.   **[8]**

   b) Write the limitations of Terzaghi's analysis for Bearing capacity with diagram.   **[2]**

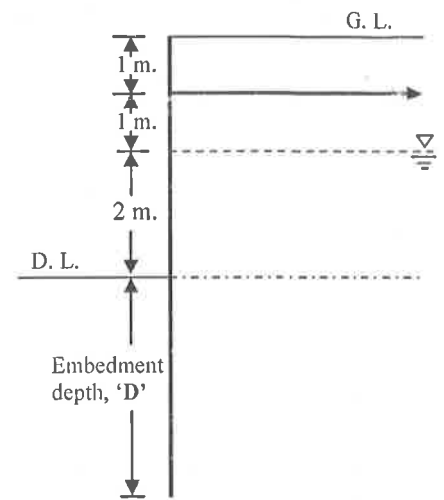G. L.

1 m.

1 m.

2 m.

D. L.

Embedment depth, 'D'

Figure.1

9. Determine the ultimate load bearing capacity of circular pile of 0.5 m diameter and of 12 m long, passing a no. of layers of granular soil of thickness of 2 m, 3.5 m, 4 m and 4.2 m from G.L. The angles of shearing resistances of the corresponding layers are 25°, 28°, 32°, 32° and the unit weights are 18 KN/m^3, 20 KN/m^3, 23 KN/m^3 and 24 KN/m^3.

SCHOOL OF ENGINEERING AND TECHNOLOGY
End-semester examination (Theory), December 2019
(Academic Session: 2019 - 20, Semester Term: Aug 2019 - Dec 2019)
Name of the Program: B.Tech, Stream: CSE, SEMESTER-V

PAPER TITLE: Theory of Computation

PAPER CODE: ECS43101

Date:

Time of Examination: **2 hours**

Maximum Marks 40

Time: 3 Hrs

No. of Students: 130

No. of Pages: 2

Answer from ALL the groups
Group A(Answer ALL questions)

1. (a) Give the language version of the decision problem: " Given any Turing Machine M over alphabet Σ, does M loop on all words over Σ?"

    (b) Let P be a decision problem known to be undecidable but semi-decidable. Will its language version be a recursive set or a recursively enumerable set?

    (c) Give an example of a decision problem which is not even semidecidable.

    (d) Specify the subset relationship among context sensitive, regular, and type 0 languages. Is it a proper subset relationship?

    (e) Given that a problem is in the class NP, is its complement also in NP? Justify your answer?

    [5 x 1 = 5]

Group B (Answer ANY THREE questions)

2. (a) Using the undecidability of the halting problem of Turing Machine (HPTM), show that the decision problem $L = \{\langle M \rangle | M$ is a Turing Machine and $L(M) = \emptyset\}$ is undecidable. Explain the reduction clearly.

    (b) Explain whether it is semidecidable or not.

    [4 + 1 = 5]

3. (a) Given a decider for a language, give a plan of generating the language.

    (b) Is it possible to have such a generator from a recognizer of a language? If so, give such a scheme; if not, explain why so.

    [2 + 3 = 5]

4. Using the pumping lemma for context free languages show that the following languages are not context free

   (a) $L = \{a^n b^n c^n, n \geq 0\}$;
   (b) $L = \{a^{i^2} | i \text{ is an integer}\}$.

   $$[2.5 + 2.5 = 5]$$

5. (a) Show that a class $\mathcal{P}$ is decidable if and only if both $\mathcal{P}$ and its complement class $\mathcal{P}^c$ are semidecidable.

   (b) Show that the complexity class P is closed under union, intersection and complementation.

   $$[2.5 + 2.5 = 5]$$

6. (a) Show that the problem RELPRIME $= \{\langle x, y \rangle | x \in \mathbb{N}, y \in \mathbb{N} - \{0\} \text{ are relatively prime }\} \in P$.

   (b) Define verifier of a language L. Show that if one has a polynomial time verifier for a language L, then one has a nondeterminsitic polynomial time decider of L.

   $$[2.5 + 2.5 = 5]$$

Group C (Answer ANY TWO questions)

7. (a) Show that HPTM is undecidable. Is it semidecidable – justify.

   (b) Consider the problem UHP $= \{\langle M \rangle | M \text{ is a TM over } \Sigma \text{ and M halts on all words over } \Sigma \}$. Show it to be undecidable.

   $$[6 + 4 = 10]$$

8. (a) State *precisely* the pumping lemma for regular languages.

   (b) Show that $L = \{w | w \text{ contains twice as many } a\text{'a as } b\text{'s }\}$ is not regular.

   (c) Show that $L = \{a^r | r \text{ is a prime}\}$ is not regular.

   $$[2 + 4 + 4 = 10]$$

9. (a) Define the class of NP-complete problems.

   (b) State the decision problems 3SAT and CLIQUE. Assuming 3SAT to be NP-complete, show that CLIQUE is NP-complete.

   $$[2 + 8 = 10]$$

ADAMAS UNIVERSITY
END-SEMESTER EXAMINATION (MAY 2019)
(Academic Session: 2019– 20, Semester Term: AUG. 2019 – DEC 2019)

Name of the Program: B.Tech
Stream: ME
Semester: V
PAPER TITLE: Thermal Power Engineering (Elective-I)
Maximum Marks: 40
Total No of questions:09

PAPER CODE: EME43110
Time duration: 3 hours
Total No of Pages:

Group A
(Answer all the questions)

$5 \times 1 = 5$

1. a) In Rankine cycle work output from the turbine is given by _____
    b) What is the difference between boiler mounting and accessories?
    c) In a constant volume process, heat transferred is equal to i) Work done ii) Change in internal energy iii) Change in enthalpy iv) None of these
    d) A device attached to the steam chest to prevent explosions due to excessive internal steam pressure a) Safety valve b) Water level indicator c) Pressure gauge d) Fusible plug
    e) What is impulse and reaction turbine?

Group B
(Answer any three questions)

$3 \times 5 = 15$

2. Describe the velocity triangle of Radial Flow Reaction Turbine. Describe the classification of Boiler. (5)

3. Derive an expression in term of critical pressure ratio for the condition of maximum discharge through the nozzle. (5)

4. A Lancashire boiler generates 2400Kg of dry steam per hour at a pressure of 11bar. The grate area is 3m^3 and 90Kg of coal is burnt per m^2 of grate area per hour. The calorific value of the coal is 33180KJ/Kg and the temperature of feed water is 17.5°C. Determine-i) Actual evaporation per kg of coal, ii) Equivalent evaporation from and at 100°C and iii) Efficiency of the boiler.(5)

5.Find the enthalpy and entropy of steam when the pressure is 2MPa and the specific volume is 0.09m^3/Kg (5)

6. a) Describe the Layout diagram of thermal power plant (2)

b) Describe the Rankine cycle with Layout, P-V, T-S, H-S diagram (3)

$2 \times 10 = 20$

7. Steam at 20bar, 360°C is expanded in a steam turbine to 0. 08bar.It then enters a condenser, where it is condensed to saturated liquid water. The pump feedback the water into boiler.a) Assuming ideal processes find per kg of steam the network and the cycle efficiency, (if the pump work is neglected) (10)

8. a) Describe the working principle of any one Water tube boiler with proper sketch. (6)

b) Describe the Ash handling unit in Steam Power Plant (4)

9. a) Dry saturated steam at 10bar is expanded isentropically in a nozzle to 0.1 bar. Using steam table only find the dryness fraction of the steam at exit. Also find the velocity of steam leaving the nozzle when the initial velocity is negligible. (3)

b) The velocity of steam at inlet to a simple impulse turbine is 1000m/s and the nozzle angle is 20°. The mean blade speed is 400m/s and the blade are symmetrical. The mass flow rate of steam is 0.75Kg/s. The friction effect on the blade are negligible and relative velocity is constant. Estimate-a) The blade angle, b) The tangential force on the blade, c) Axial thrust, d) The diagram power, e) the diagram efficiency.(7)

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SCHOOL OF ENGINEERING AND TECHNOLOGY
END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Name of the Program: B. Tech   Semester: V
Stream: E.C.E.
PAPER TITLE: Digital Communication   PAPER CODE: EEC 43103
Maximum Marks: 40   Time duration: 3 hours
Total No of questions: 10   Total No of Pages: 02

Note:
  1. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
  2. Assumptions made if any, should be stated clearly at the beginning of your answer.
  3. No Mobile Phones will be permitted in the Examination Hall.

Answer all the Groups
Group A
Answer all the questions of the following   **5 x 1 = 5**

1. **a)** Find the Nyquist rate and the Nyquist Interval for the signal: $x(t)= 1/2\Pi \cos (4000 \Pi t)$ $\cos (1000 \Pi t)$.
    b) Represent BPSK signals in the signal space and find distance between them.
    c) What do you mean by moments and variance? Give expression.
    d) What is the remedy to reduce ISI?
    e) What is the difference between coherent & non-coherent digital modulation techniques?

GROUP –B
(Short Answer Type Questions)
Answer *any three* of the following   **3 x 5 = 15**

2. **a)** Briefly describe the 'Nyquist Criterion for distortion less baseband transmission' by using time and frequency domain representation.
    b) Briefly describe the compressor and expander characteristics of companding. **[3+2]**

3. **a)** Write down the properties of Cumulative Distribution Function (CDF).
    b) What do you mean by Random variables? What are the types? Give an example of each.
    [3+2]

4. **a)** Consider the binary sequence [0 1 0 0 1 0 1 1]. Draw the waveforms for the following
        i) Split phase Manchester format
        ii) Polar RZ signal
        iii) AMI RZ signal
    b) Represent QPSK signals in the signal space and find distance between them. What is the significance of each? Explain briefly.   **[3+2]**

5. **a)** What is the analogy between signals & vectors? What is Schwartz Inequality?
    b) Explain the generation of ADM with suitable block diagram.   **[2+3]**

6. **a)** What do you mean by quantization error?
    b) What is the bandwidth of BFSK signal?
    c) Prove that quantization noise or error in PCM is $\frac{\Delta^2}{12}$, where Δ is the step size. **[1+1+3]**

GROUP –C
(Long Answer Type Questions)
Answer *any two* of the following   2 x 10 = 20

7.   a) Draw the block diagram of a QPSK reception and explain its principle of operation.
     b) Given a sine wave of frequency f_m and amplitude A_m applied to a Delta Modulator having a step size, Δ. Show that 'Slope Overload Distortion' will occur if,

$$A_m \leq \frac{\Delta}{2\Pi f m T_S}$$ Here T_S is the sampling period.

     c) Derive and explain the transmission bandwidth in PCM.   [4+3+3]

8.   a) A continuous random variable has a Probability Density Function (PDF) expressed as, $f_X(x) = ae^{-b|x|}$, here X be the random variable whose values lie in the range x = -α to α.

          i) Determine the relationship between a & b.
          ii) The probability that outcome lies between 1 and 2.

     b) What is ergodic process?
     c) Explain the properties of auto correlation function.   [5+2+3]

9.   a) With suitable block diagram explain the reception of Binary PSK technique.
     b) Prove that the difference between f_H and f_L is minimum in MSK technique.
     c) Briefly describe how Gaussian MSK (GMSK) is used for GSM wireless communication?   [4+4+2]

                                                                              [2x5 =10]

10. Write short notes any two of the following:
     a) A-Law & μ-Law of Companding
     b) Differential Pulse Code Modulation
     c) Zero Forcing Equalizer
     d) Sample & Hold circuit generating Flat-top sampled PAM

(BEST OF LUCK)

ADAMAS UNIVERSITY
SCHOOL OF ENGINEERING AND TECHNOLOGY
END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Name of the Program: B.TECH
PAPER TITLE: Power System-1
Maximum Marks: 40
Total No of questions: 09

PAPER CODE: EEE43101
Time duration: 3 hours
Total No of Pages: 01

(Any other information required for the student may be mentioned here)

Answer all the Groups

Group A
(Answer all the questions)

$$5 \times 1 = 5$$

1. i. What are the advantages of corona effect?
   ii How frequency is related with power system stability?
   iii. Why ABCD parameters are used in transmission line calculation?
   iv. What are the limitations of DC distribution system?
   v. Draw a single line diagram showing a power system from generation point to distribution point.

Group B
(Answer any three questions)

$$3 \times 5 = 15$$

2. What are the properties of a good conductor? Why A.C.S.R conductors are used? (2+3)
3. Each conductor of a 3-phase high-voltage transmission line is suspended by a string of 4 suspension type disc insulators. If the potential difference across the second unit from top is 13·2 kV and across the third from top is 18 kV, determine the voltage between conductors.
4. A 3-phase, 220 kV, 50 Hz transmission line consists of 1·5 cm radius conductor spaced 2 meters apart in equilateral triangular formation. If the temperature is 40°C and atmospheric pressure is 76 cm, calculate the corona loss per km of the line. Take mo = 0·85.
5. What is surge impedance loading?
6. Explain: Feeder and Service Main.

Group C
(Answer any two questions)

$$2 \times 10 = 20$$

7. Derive an expression for inductance of a 3 phase overhead line in case of symmetrical and unsymmetrical spacing.
8. Evaluate the generalised circuit constants for a medium line model — using nominal T method.
   A 3-phase, 50 Hz transmission line 100 km long delivers 20 MW at 0·9 p.f. lagging and at 110 kV. The resistance and reactance of the line per phase per km are 0·2 Ω and 0·4Ω respectively, while capacitance admittance is 2·5 × 10− 6 siemen/km/phase. Calculate : (i) the current and voltage at the sending end (ii) efficiency of transmission. Use nominal T method.(5+5)
9. Classify different AC distribution systems? What are the disadvantages of Radial Distribution system?

ADAMAS UNIVERSITY
SCHOOL OF ENGINEERING AND TECHNOLOGY
END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Name of the Program: B.Tech.   Semester: V
Stream: ME
PAPER TITLE: Metrology and Measurements   PAPER CODE: EME43101
Maximum Marks: 40   Time duration: 3 hours
Total No of questions: 09   Total No of Pages:02

Group – A
(Answer all questions)

1.   [5×1]

   i.   State the different types of errors.
   ii. Differentiate between direct and indirect measurement.
   iii. Define inspection and why is it required in industries?
   iv. What is sine bar?
   v.   What do you understand by the term "Least Count"?

Group – B
(Answer any three questions)   [3×5]

2. a) Define the term metrology as applied to engineering industry.   [2]
    b) State the important elements of measurement.   [3]
3. a) Define Comparator and classify them   [2]
    b) Explain in brief how a sine bar is used for angular measurement?   [3]
4. Why do we prefer hole basis system over a shaft basis system?   [5]
5. Describe briefly the information needed for designating the surface finish on drawing, give
    suitable example   [5]
6. Define fits and describe the various types of fits in brief   [5]

7. a) Differentiate between Workshop Gauges & Inspection Gauges. [4]

b) A 30mm diameter hole is made on a lathe according to the limits 30.035 mm and 30 mm. The following two grades of shaft are used to fit in the hole a) dia. 29.955 mm and 29.924 mm b) dia. 30.055mm and 30.050 mm. Calculate the maximum tolerance, clearance and indicate the type of fit in each case. [6]

8. a) State the uses and practical applications of a dial test indicator [4]

b) A dimension of 57.895 is required to be set with the slip gauges as accurately as possible. Two sets M45 (Grade 0) and M112 (Grade II) are available. The range and the number of pieces in each set are given below:

M45			M112		
Range(mm)	Steps(mm)	No. of blocks	Range(mm)	Steps(mm)	No. of blocks
1.001 to 1.009	0.001	9	1.005	-	1
1.01 to 1.09	0.01	9	1.001 to 1.009	0.001	9
1.1 to 1.9	0.1	9	1.01 to 1.49	0.01	49
1.0 to 9	1.0	9	0.5 to 24.5	0.5	49
10 to 90	10.0	9	25.0 to 100.0	25	4

The permissible errors in 1/100000 mm units in the mean length of Grade 0 and Grade II are stated below:

Length(mm)	Grade II	Grade 0
0 to 20	+50	±10
	-20	
20 to 60	+80	±15
	-50	

Determine the set you will select and the range of the dimension set with the selected set. [6]

9. a) Sate the basic differences between a measuring instrument and a comparator. Define sensitivity in both the cases. [4]

b) Design a workshop type progressive type GO and NO-GO plug gauge suitable for 25H7, with the following information:
   i)   25mm lies in the diameter step of 18-30mm
   ii) $i = 0.45D^{1/3} + 0.001D$
   iii) $IT7 = 16i$ [6]

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END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Name of the Program: B.Tech.   Semester: V
Stream: CSE
PAPER TITLE: Operating System
Maximum Marks: 40   PAPER CODE: ECS43103
Total No of questions: 9   Time duration: 3 hours
                                      Total No of Pages: 2

Answer all the Groups
Group A
(Answer all the questions)

5 × 1 = 5

1. a) Whenever a process completes a BLOCKED state, where does it move to?
    b) When does a page fault occur?
    c) What is a Shell in Operating system?
    d) In virtual memory management what is the designation of the addresses that are generated by CPU ?
    e) What is the state of a process after it encounters I/O instructions?

Group B
(Answer any three questions)

5 × 3 – 15

2. Define Deadlock. State the four necessary conditions for a deadlock situation to occur in a system?

(1+4)

3. Explain the working of bounded-buffer problem in synchronization.

4. What is cooperating process? Give an example scenario where process cooperation becomes relevant— Explain.   (1+4)

5. Describe the two basic operations on semaphore. Explain whether any integer variable with similar operations can act as semaphore or not.   (2+3)

6. Describe physical and logical formatting of Disk.   (2.5+2.5)

Group C
(Answer any two questions)

2 × 10 = 20

7. Consider the set of jobs < J1, J2, J3, J4, J5 > assumed to arrive at time sequence as < 0,1,2,6,12> with the length of the CPU processing time < 7, 5, 3, 2, 3>.

[1]

(i) Draw the Gantt Chart illustrating their execution using Shortest Job First (SJF) and Shortest Renaming Time First (SRTF / SJF Preemptive) scheduling Algorithms. (6)

(ii) Calculate the Average Turn Around time and Average waiting time for both above scheduling algorithms. (2+2)

8. (a) Discuss the critical section (CS) problem in detail. Also write the solution algorithm for producer-consumer problem using semaphore. (2+4)

(b) What is the use of process table in process management? (3+1)

9. a) Write down the merits and demerits of a virtual memory system. (5)
b) Consider a virtual memory system with combined implementation, segmentation and paging. Describe the address translation scheme along with necessary data structures. (2+3)

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END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Name of the Program: B.Tech.   Semester: V
Stream: CE
PAPER TITLE: STRUCTURAL ANALYSIS-II   PAPER CODE: ECE43103
Maximum Marks: 40   Time duration: 3 hours
Total No of questions: 9   Total No of Pages: 3

Answer all the Groups
Group A
(Answer all the questions)

$5 \times 1 = 5$

1. **a)** Find out Statical Indeterminacy of the following structure:

   b) Find out Statical Indeterminacy of the following structure:
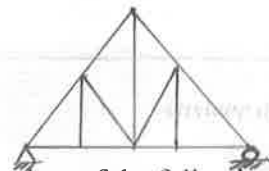
   c) Find out Degree of freedom of the following structure:

   d) Find out Kinematic Indeterminacy of the following structure:

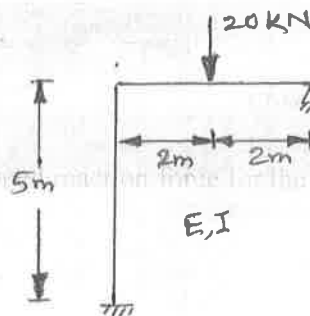   **e)** Find out Kinematic Indeterminacy of the following structure:
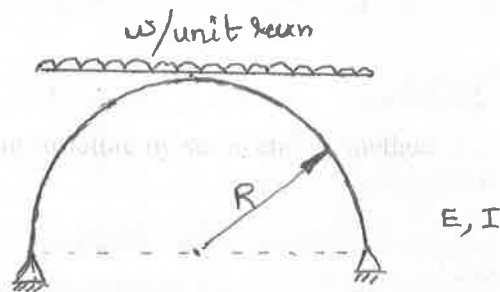

[1]
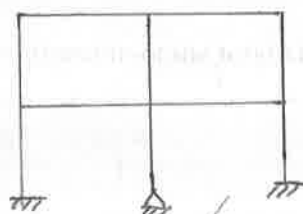
$3 \times 5 = 15$

2. Find the propped reaction force for the following structure by consistent deformation method.
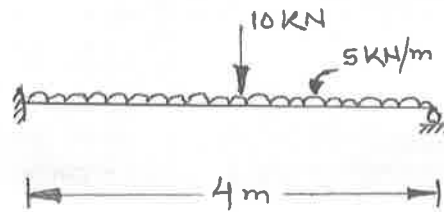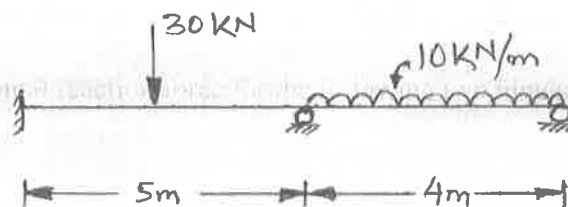

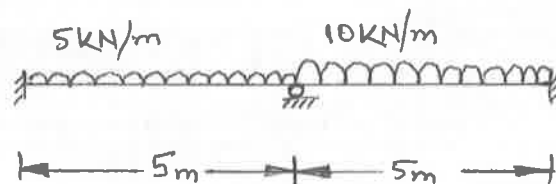3. Analyse the following structure by strain energy method.

4. Find out the horizontal reaction force for the following two hinged arch.

5. Analyse the following structure by moment distribution method.

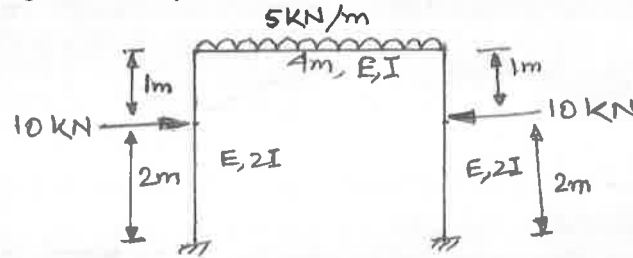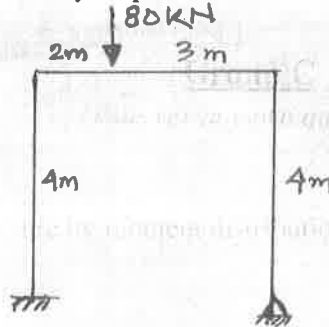6. Analyse the following structure by slope deflection method.
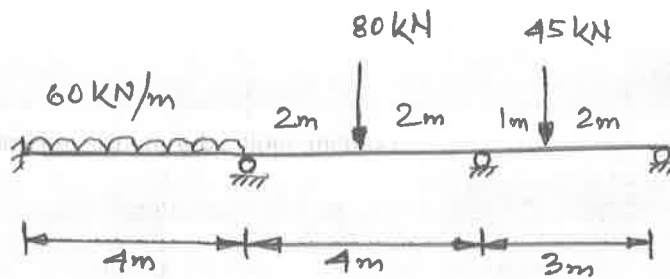

[2]

$2 \times 10 = 20$

7. Analyse the following structure by moment distribution method.

8. Analyse the following structure by slope method.

9. Analyse the following structure by Kani's method.

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END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Name of the Program: B.Tech. Semester: V
Stream: CSE/ME/EE/ECE
PAPER TITLE: Environmental Science PAPER CODE: SGY43113
Maximum Marks: 40 Time duration: 3 hours
Total No of questions: 09 Total No of Pages: 02

(Any other information required for the student may be mentioned here)

Answer all the Groups

Group A
(Answer all the questions)

$5 \times 1 = 5$

1. **a)** Which one is more harmful among $PM_{2.5}$ and PM_{100} and why?
   b) What are the diverse applications of solar energy?
   c) What is "hazardous waste"?
   d) What is detritus food chain?
   e) What is a trickling filter?

Group B
(Answer any three questions)

$5 \times 3 = 15$

2. What is "greenhouse effect"? Name major greenhouse gases. (3+2=5)

3. Discuss the drawbacks of "open dumping" and "incineration" in solid waste management. (5)

4. Describe an active solar system mentioning the different components of an active solar system. What is the benefit of using flat plate panel collector in comparison to curved solar collector such as, parabolic mirror? (3+2=5)

5. Define BOD and COD. What is the importance of BOD/COD ratio? Can this ratio have a value of more than 1? Why? (2+2+1=5)

6. What is decibel? Express mathematically. What is noise induced hearing loss? (2+1+2=5)

Group C
(Answer any two questions)

$2 \times 10 = 20$

7. Identify the primary and secondary air pollutant(s) from the list given below with an appropriate explanation – (i)VOCs, (ii) ozone and (iii) CFC and (iv) sulphuric acid droplets. Mention the sources and

adverse effect of the following criteria pollutants:(i) carbon monoxide and (ii) oxides of nitrogen. Discuss the role of CFCs on ozone layer depletion. (4+3+3=10)

8. Why is EIA an important decision-making tool for mitigating environmental disasters? What are the basic steps involved in an EIA process? What is the importance of 'Public hearing" in EIA? Which projects are exempted from public hearing? (3+3+2+2=10)

9. What do you mean by hardness of water? What is temporary and permanent hardness of water? If the 3 day BOD at 15°C = 425 mg/L, what will be its 7 day BOD at 15°C?

Given: K (Deoxygenation constant) = 0.23/day

Assume that the deoxygenation follows first order rate kinetics.

[Hint: $K_{T°C} = K_{20°C}*(1.047)^{T-20}$]

BOD exerted = Ultimate BOD - BOD remaining at that time

Or, BOD exerted = $L_0 - L_T$)

(2+3+5=10)

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END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Name of the Program: B.Tech.   Semester: V
Stream: ME
PAPER TITLE: Automotive System   PAPER CODE: EME43107
Maximum Marks: 40   Time duration: 3 hours
Total No of questions: 9   Total No of Pages: 1

(Any other information required for the student may be mentioned here)

Answer all the Groups
Group A
(Answer all the questions)

$5 \times 1 = 5$

1. a) What do you mean by vapor pressure?

   b) Explain linear and rotary actuators?

   c) Draw sketch of plug valve.

   d) What is solenoid with context to relays?

   e) What is the graphical symbol of double acting cylinder with single piston rod.

Group B
(Answer any three questions)

$3 \times 5 = 15$

2. Classify Pumps and explain positive displacement pump and Non-positive displacement pump?

3. Explain the working of double pump hydraulic circuit?

4. Explain the working of a simple pneumatic system with help of diagram?
5. Describe pressure regulation in a pneumatically control system?

6. Explain the working of counterbalance valve with the help of its hydraulic circuit?

Group C
(Answer any two questions)

$2 \times 10 = 20$

7. Describe pumping theory with neat diagram?

8. Sketch and explain working of Electromechanical relay?

9. Briefly explain: (a) Gear pump (b) Lobe pump (c) vane pump

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END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester: Aug. 2019 – Dec. 2019)

Name of the Program: B.Tech.   Semester: V
Paper Title: **Microprocessors and Microcontrollers**   **Paper Code: EEC43101**
Maximum Marks   : 40   Time duration   : 3 hours
Total No of questions : 8   Total No of Pages   : 1

Part A
(*Answer all questions*)

1) Please answer in one or two words   **Marks: 5×1=5**

   i)   Which type of stack is used in 8085?
   ii)   Which are the level-triggering interrupts?
   iii)   8051 was developed using which technology?
   iv)   How much on chip RAM is available in 8051 microcontroller?
   v)   Which flags can be set or reset by the programmer and also used to control the operation of the 8086 processor?

Part B
(*Answer any three questions*)

Marks: 3×5=15

2) Draw and explain the architecture of 8085 microprocessor.

3) Draw and explain the minimum and maximum modes of 8086 microprocessor.

4) Explain the memory interfacing of 8086 microprocessor.

5) Explain all the interrupts in 8085 microprocessor along with details of the programming word.

Part C
(*Answer any two questions*)

Marks: 2×10=20

6) Draw and explain in details the architecture of 8051 microcontroller.

7) Write an assembly language program to convert numbers from any number systems having different base for 8085 microprocessor.

8) Write an assembly language program to subtract two numbers for 8051 microcontroller showing examples of the results with and without borrow.

5v

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END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Name of the Program: B.Tech.　　　　　　　　　　Semester: V
Stream:　CE
PAPER TITLE: Design of R.C Structure　　　　　　PAPER CODE: ECE43101
Maximum Marks: 40　　　　　　　　　　　　　　Time duration:　3 hours
Total No of questions: 09　　　　　　　　　　　　Total No of Pages: 02

(Use IS-456:2000 if required)

Answer all the Groups
Group A
(Answer all the questions)

$5 \times 1 = 5$

1.　a)What is the value of modulus of elasticity of M25 grade concrete as per IS 456?
　　b)What is the ratio of limiting value of neutral axis and effective depth for a beam designed with M20 concrete and Fe 415 steel.
　　c)What is the minimum number of bars used in circular column?
　　d)What is the maximum value of length/ lateral dimension for a short RC column?
　　e) What is the anchorage value of a 8mm diameter steel hook?

Group B
(Answer any three questions)

$3 \times 5 = 15$

2.　Find the moment of resistance by W.S.M of a beam section 250mm wide and 500mm effective depth reinforced with 4-16mm diameter mild steel. Consider M15 grade concrete.

3.　A rectangular beam section of 250 mm wide and 475 mm effective depth is reinforced with 2-25 mm and2-20mm diameter steel. Determine the shear reinforcement required to resist 120 kN force. Consider M25 grade concrete and Fe415 steel.

4.　Fix the dimension of an isolated square footing of a R.C columnhaving a base size 500 mm x 500 mm subjected to a vertical load of 650 kN. The allowable bearing capacity of soil is 110 kN/m^2. Use M20 and Fe 415 steel. (Find out the thickness of footing considering punching shear failure only).

5.　Design a concrete column of size 350mm x 350mm with both end hinge, subjected to a vertical factored load of 700kN. The height of column is 3.5m. Perform all necessary checks and draw the detailing of reinforcement. UseM20 grade concrete and Fe 415 steel

6.　A four span continuous R.C slab of clear span 3.75m each supported on 250mm wide column. The slab is subjected to live load of 3 kN/m^2 and a dead load (due to floor finish, cement plaster, partition wall etc.) of 1.2kN/m^2 excluding self weight. Find out all the critical bending moments and shear force using suitable co-efficient as given in IS:456.

7. Design a both end fixed rectangular column of 4m height subjected to a factored load of 1500 kN, 115 kN-m moment acting parallel to larger dimension and 85 kN-m moment acting parallel to shorter dimension. The size of the column is 350mm x 500 mm. UseM20 grade concrete and Fe 415 steel. Draw a neat sketch to show the reinforcement details.

8. Design a dog-legged stair for a building in which the vertical distance between floors is 3.24m. The stair hall measures 2.5m x 5m. The live load may be taken as 3500 N/m^2. (Take Floor Finish as 1.2kN/m^2). Use M20 grade concrete and Fe415 steel. Take bearing of slab=150mm

9. Design by limit state method afloorslab of clear dimension 3.9m x 3.2m having one long edge continuous, supported by 250mm wide beam all around. Use M20 concrete and Fe415 steel. (Take clear cover= 20mm). Also drawa neat sketch to show the reinforcement details.

Name of the Program:B.Tech.   Semester: V

Stream: COMPUTER SCIENCE AND ENGINEERING

PAPER TITLE: COMPUTER NETWORKS   PAPER CODE: ECS43105

Maximum Marks: 40   Time duration: 3 hours

Total No of questions: 09   Total No of Page(s): 01

Answer all the Groups

Group A

(Answer all the questions) $5 \times 1 = 5$

1. a) State the name of all layers of OSI model.
    b) Explain Circuit Switching in brief.
    c) State the difference between Core and Cladding of Fibre optic cable.
    d) State the significance of Backoff Time in case of Pure ALOHA protocol.
    e) Mention two ways using which a node can detect a collision using CSMA/CD.

Group B

(Answer any three questions) $5 \times 3 = 15$

2. Discuss DC component of signal with suitable diagram.

3. Explain Sliding Window Protocol with separate diagrams in terms of sender and receiver.

4. Explain with suitable diagram the different classes of addresses of IPv4 protocol.

5. Explain in details Token Bucket Algorithm.

6. Write short notes on – i. Domain Name Space (DNS) ii. Firewall.   (2.5 + 2.5 = 5)

Group C

(Answer any two questions) $2 \times 10 = 20$

7. Define Multiplexing. Explain Frequency Division Multiplexing (FDM), Wavelength Division

Multiplexing (WDM) and Time Division Multiplexing (TDM) with individual diagrams. (1+9 = 10)

8. Explain in details all the Line Coding Schemes (i.e. Unipolar, Polar, Bipolar, Multilevel, Multitransition) with suitable diagrams.

9. Define Address Resolution Protocol (ARP). Explain ARP Packet. Explain ARP Request and ARP Reply with suitable diagrams. Explain four cases of ARP for data communication between sender and receiver within same as well as different networks (i.e. using Router).   (2 + 2 + 2 + 4 = 10)

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END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Name of the Program: B.Tech   Semester: V
Stream:
PAPER TITLE: Machine Learning   PAPER CODE: ECS43109/~~ECS52107~~
Maximum Marks: 40   Time duration: 3 hours
Total No of questions: 9   Total No of Pages: 2

Answer all the Groups
Group A
(Answer all the questions)

$5 \times 1 = 5$

1.
  a. Give an example of a parametric machine learning algorithm.
  b. What is the equation of both the parameters in Simple Linear Regression?
  c. How is the number of features decided in a given dataset?
  d. Is Fuzzy C-Means clustering a Supervised method?
  e. Write the expression of error gradient for a single layer ANN for the backpropagation of error.

Group B
(Answer any three questions)
$3 \times 5 = 15$

2. Illustrate using a suitable example how supervise learning can be used in handling loan defaulters.
3. What is unsupervised learning, give an example? How is hard clustering different from soft clustering? Explain using an example.   2+3
4. What is meant by the training set? How does it help to achieve accuracy in classification algorithm? Explain using an example.   2+3
5. Discuss the implementation of XOR logic using multilayer perceptron in the context of non-linear separability.
6. Apply Hebb rule method to train patterns that implements 2-input AND NOT logic function and find the optimal weight for 100% accuracy for 2-input AND NOT logic.

Group C
(Answer any two questions)

$2 \times 10 = 20$

7. Describe Gradient Descent training rule. Briefly describe its application in ANN using an example.   5+5
8. Suppose that we want to build a neural network that classifies two-dimensional data (i.e., X = [x1, x2]) into two classes: diamonds and crosses. We have a set of training data that is plotted as follows:
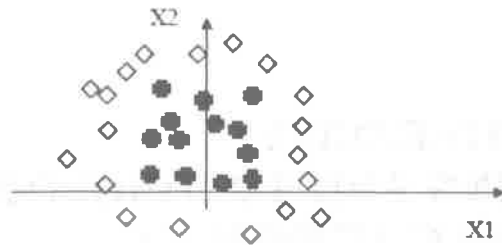
Draw a network that can solve this classification problem. Justify your choice of the number of nodes and the architecture for this example. Draw the decision boundary for this training set.   5+5

9. The following dataset will be used to learn a decision tree for predicting if a person is Happy (H) or Sad (S) based on the attributes given in the table below. Answer the following:

    a. Find the probability P(Emotion|Wig=Y)?   5+5

    b. Find the probability P(Emotion|Ears=3)?

Color	Wig	Num. Ears	(Output) Emotion
G	Y	2	S
G	N	2	S
G	N	2	S
B	N	2	S
B	N	2	H
R	N	2	H
R	N	2	H
B	N	2	H
R	Y	3	H

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END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester: Aug. 2019 – Dec. 2019)

Name of the Program: B.Tech   Semester: V

Paper Title   : Transportation Engineering- I   **Paper Code: ECE 43107**

Maximum Marks   : 40   Time duration: 3 Hrs

Total No of questions : 9   Total No of Pages: 2

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1. Objective Type Questions: Marks: 5 x 1 = 5

(a) As per IRC Standards what are the specifications of a "STOP" sign?

(b) What considerations are made for the design of a Transition Curve?

(c) Draw the difference in traffic movement in a T- junction before and after providing traffic channelizing island.

(d) What do you mean by "Jam Density" and "Free Flow Speed"?

(e) What is the full form of PCU? What is its necessity?

Short Answer Type Questions (*Answer any Three*):   (3 x 5) = 15

(2) What are the different types of gradient found in a highway? Briefly discuss about them.

(3) A valley curve is formed by a descending grade of 1 in 25 meeting an ascending grade of 1 in 30. Design the length of valley curve to fulfil both comfort condition and head light sight distance requirements for a design speed of 80 kmph. Assume allowable rate of change of centrifugal acceleration is equal to 0.6 m/sec^3.

(4) There are 5 alternate proposals of road plans for a backward district. The details are given below. Justify with reasons which proposal is the best. Assume utility units of 0.5, 1.0, 2.0, 4.0 and 8.0 for the given 5 population ranges and utility units of 1.0 and 5.0 per 1000 tonnes of agricultural and industrial products served.

Proposal	Total Road Length (km)	No. of towns and villages served with population range					Productivity in thousand tonnes	
		<2000	2001- 5000	5001- 10000	10001- 20000	>20000	Agriculture	Industrial
A	500	100	150	40	20	3	150	20
B	600	200	250	68	28	3	220	25
C	700	270	350	82	36	4	300	35
D	800	280	410	91	41	4	400	42
E	900	290	430	96	44	4	430	45

(5) Derive an equation for finding the super elevation required if the design coefficient of lateral friction is 'f'. Mention other variables used in this expression.

(6) With a neat sketch show different design elements within a rotary intersection.

Long Answer Type Questions (*Answer any Two*):   **(2 x 10) = 20**

(7) (a) Speed-Density equation on an urban road is given by $u = u_f (1 - k^2/k_j^2 + k/k_j)$ where u_f is free flow speed, k is density and k_j is jam density. For what value of density the maximum flow occurs? What is the maximum capacity attained for the given problem?

(b) With neat sketches show different form of "At-Grade Intersection".   **(5+5)**

(8) (a) With a neat sketch show different major and minor conflicts in a 4 leg intersection carrying 2 lane 2 way road in both the carriageway and calculate total number of conflicts. Also show the improvement in the number of conflicts if any one of the carriageway is regulated with one way traffic.   **(3+2)**

(b) For the data given below compute the Time Mean Speed and Space Mean Speed. Finally determine the concentration of the traffic stream.   **(5)**

Speed Range (kmph)	0-10	10-20	20-40	40-60	60-80	80-100
Frequency	8	12	32	45	25	6

(9) From a moving vehicle surveying technique over a 4.25 km long stretch of road following data is obtained in a tabular form. Find (i) Mean flow of the traffic stream in both (N-S) and (S-N) direction.   **(10)**

(ii) Average journey time in both (N-S) and (S-N) direction.

(iii) Journey speed and running speed in both (N-S) and (S-N) direction.

Direction	Journey Time (Min)	Stopped Delay (Min)	No. of Vehicles		
			Overtaking	Overtaken	In Opposite Direction
N to S	6.45	1.40	4	7	268
S to N	7.00	1.20	5	3	186
N to S	6.25	1.25	5	3	280
S to N	7.38	1.50	2	1	195
N to S	6.50	1.26	3	5	250
S to N	7.30	1.55	2	2	175
N to S	6.65	1.15	2	5	285
S to N	7.65	1.75	3	2	175

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END-SEMESTER EXAMINATION: DECEMBER 2019
(Academic Session: 2019 – 20, Semester Term: Aug 2019– Dec 2019)

Name of the Program:B.Tech.   Semester: V
Stream: MEPAPER TITLE: Internal Combustion Engine   PAPER CODE:EME43111
Maximum Marks: 40
Total No of questions: 09

Time duration: 3 hours
Total No of Pages: 02

Answer all the Groups
Group A
(Answer all the questions)

$5 \times 1 = 5$

1. a)The diesel engines are also known as _____ engines.
    b) In a four stroke cycle, the minimum temperature inside the engine cylinder occurs at the _____.
    c) The thermal efficiency of a standard Otto cycle for a compression ratio of 5.5 will be _____.
    d)The injection pressure in a diesel engine is about _____.
    e)High speed compression engines operate on _____.

Group B
(Answer any three questions)
$3 \times 5 = 15$

2.Derive the efficiency of a diesel cycle. **(5)**

3.The cubic capacity of a four stroke over square SI engine is 245 cc. The over square ratio is 1:1. The clearance volume is 27.2 cc. Calculate bore, stroke and compression ratio of the engine. **(5)**

4. Write a short note on MPFI system. **(5)**

5. a) Define – Brake Power, Indicated Power and Mechanical efficiency of an engine. **(3)**

   b) How the A/F mixture requirement varies with different stages of steady operations? **(2)**

6. With a neat diagram, explain Valve- Timing diagram of a 4-stroke engine. **(5)**

Group C

(Answer any two questions)

$$2 \times 10 = 20$$

7. In an air standard diesel cycle, the pressure and volume at the beginning of compression are 100 kPa and 0.03m³ respectively. Pressure after isentropic compression is 4.2 MPa, and after isentropic expansion is 200 kPa. Determine i) Compression ratio, ii) Cut-off ratio, iii) expansion ratio and iv) Cycle efficiency.**(10)**

8. A four stroke gas engine has a bore of 20 cm and stroke of 30 cm runs at 300 rpm firing every cycle. If the air fuel ratio is 4:1 by volume and volumetric efficiency on NTP basis is 80%, determine the volume of gas used per minute if the calorific value of the gas is 8 MJ/m3 and brake thermal efficiency is 25%, determine the brake power of the engine.**(10)**

9. Derive an expression for air-fuel ratio delivered by a simple carburetor, neglecting the effect of compressibility. **(10)**