FACULTY OF ENGINEERING

B.E. 3/4 (Civil) I - Semester (Main) Examination, December 2015

Subject : Transportation Engineering

Time : 3 hours   **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1	Define Camber. Write down the recommended values of camber for different types of roads.	2
2	Write any three uses of origin and destination studies.	2
3	What do you understand by bitumen 80/100?	2
4	How is the edge temperature stress calculated for the design of Rigid pavements?	2
5	Define 30th highest hourly volume.	2
6	Write the functions of sleepers, and ballast.	3
7	Explain ICAO and IAAI? Where are the head quarters situated?	3
8	Calculate the cant deficiency for 5 degrees curve on B.G. track.	3
9	Define cross wind component and wind coverage.	3
10	Write any six components of an airplane.	3

PART – B (5 x 10 = 50 Marks)

11 Briefly describe the process of engineering surveys for highway alignment through conventional and modern method.   10

12 Explain highway capacity and level of service concept as per HCM 2000 design manual.   10

13 a) Explain the structural differences between Flexible pavement and Rigid pavement.   5

    b) Explain the step by step procedure for conducting CBR test with neat sketch.   5

14 a) What are the requirements of good railway track? Explain what kind of forces and loads act on the track.   5

    b) Define the term equilibrium cant and cant deficiency on a railway track for a main line and a branch line on 5° curve, calculate the super elevation and the speed on the branch line if the maximum speed permitted on the main line is 48 km/h.   5

15 a) How is the best orientation of a runway decided?   5

    b) Explain how the correction for elevation, temperature and gradient are applied to basic runway length.   5

16 Design a flexible pavement as per recent IRC guidelines for construction of a new bypass with the following data : 10

    i)   No. of commercial vehicles as per last count = 1000 CVPD
    ii) Period of construction = 3 years
    iii) Annual traffic growth = 8%
    iv) Design CBR of sub grade soil = 10%
    v) Category of road = NH, two lane single carriageway
    vi) Design life = 10 years
    vii) VDF = 2.80; growth rate 7.5% 10

17 Write any four of the following : 10
    a) Creep in rails and its remedies
    b) Permanent way structure with neat sketch
    c) Intersections and rotaries
    d) Accident studies and remedies
    e) Bitmen and Tar

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FACULTY OF ENGINEERING

B.E. 3/4 (EEE/Inst.) I - Semester (Main) Examination, December 2015

Subject : Linear Integrated Circuits

Time : 3 hours   Max. Marks : 75

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1 What is slew rate? Explain its significance.	3
2 Why the offset balancing techniques are required for an Op-Amp? Explain.	3
3 Distinguish between rectifier and precision rectifier.	2
4 Draw the circuit of a voltage limiter.	2
5 Draw the pin diagram of 555 timer and explain the importance of each pin.	3
6 Write the advantages of R-2R D/A converter over weighted resistor D/A converter.	2
7 What is hybrid regulator?	3
8 Why current sensing protection is required for the voltage regulator?	2
9 Define the cutoff frequency for the filter.	2
10 What is balanced demodulator?	3

PART – B (5 x 10 = 50 Marks)

11 a) Explain the frequency compensating techniques of an Op-Amp.   7
   b) Derive the voltage gain equations for an inverting and non-inverting modes of Op-Amp.   3

12 a) Explain the operation of a positive clamper by drawing necessary waveforms.   5
   b) Draw and explain the operation of a difference amplifier.   5

13 Explain the operation of a triangular waveform generator. Derive the equation for frequency of oscillations.   10

14 a) Explain in detail about the working of any one type of D/A converter.   5
   b) Design a square wave oscillator for a frequency of 2kHz.   5

15 a) Explain the operation of a shunt regulator using Op-Amp.   5
   b) Explain the operation of a fixed voltage regulator.   5

16 a) Design a second order butterworth high pass active filter with a voltage gain of 2.5 and cutoff frequency of 5Hz.   7
   b) If a band pass filter has a resonant frequency of 1200 Hz and a bandwidth of 3000 Hz. Find the lower and upper cutoff frequencies.   3

17 Write a short notes on :   10
   a) Switched capacitor filter   b) PLL

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FACULTY OF ENGINEERING

B.E. 3/4 (ECE) I - Semester (Main) Examination, December 2015

Subject : Automatic Control Systems

Time : 3 hours   Max. Marks : 75

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1	What are the characteristics of negative feedback?	2
2	Distinguish time variant and time invariant systems.	3
3	What is SFG, why SFG is preferred over black diagram?	3
4	Write the Mason's gain formula.	2
5	Explain R.H. criterion of stability.	3
6	Define : Break in point and breakaway point with respect to root locus pot.	2
7	Give the advantages of bode plots over Nyquist plot.	3
8	Differentiate O.L. and C.L. transfer function.	2
9	What are compensators, explain briefly.	3
10	What are the properties of state transition matrix?	2

PART – B (50 Marks)

11 Derive the $T.F = \dfrac{C(s)}{R(s)}$ of the given system using block diagram reduction.   10
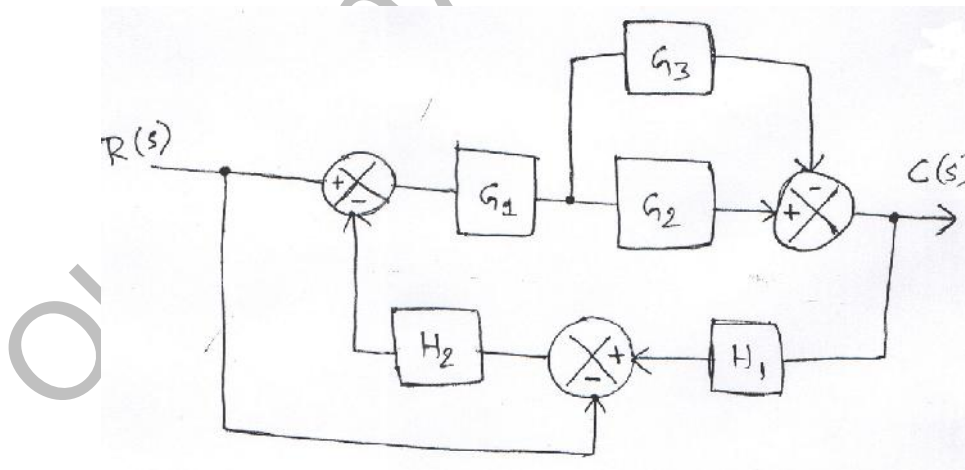
12 a) What are synchros? Describe synchro as error detector.   5
   b) Explain the unit step response of second order system for undamped case.   5

13 Construct the root locus for the given   10

$$G(s)H(s) = \frac{K}{S(S+4)\left(S^2 + 4S + 20\right)}$$

14 Sketch the bode plot in magnitude and phase, also find the stability of the system.　10

$$G(s) = \frac{10(1+0.5s)}{s(1+0.1s)(1+0.2s)}$$

15 a) Write the merits of digital control system over analog control system.　5
   b) Explain the block diagram of digital control system.　5

16 Construct state model for the system characterized by differential equation
   $\dddot{y} + 6\ddot{y} + 11\dot{y} + 6y = 4$. Also construct the block diagram of the system.　10

17 Write short notes on :
   a) Need for compensation　3
   b) DC Servo motor　4
   c) System stability　3

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FACULTY OF ENGINEERING

B.E. 3/4 (Mech.) I - Semester (Main) Examination, December 2015

Subject : Manufacturing Process

Time : 3 hours   **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1 What is the purpose of core prints and chaplets?
2 What is directional solidification. If directional solidification is not achieved what is the defect that occur in the casting?
3 State the advantages of induction furnace over cupola.
4 How are collapsible plastic bottles manufactured? Explain the process in brief.
5 What are the fluxes used in forge welding? What is the purpose of the flux in forge welding?
6 What are the filler metals used in soldering and brazing processes?
7 In projection welding, how do you justify the cost incurred in embossing projections?
8 What are the reasons for hot cracks occurring in welding?
9 How do you decide minimum and maximum temperatures in a hot working process?
10 What is the difference between blanking and piercing operations?

PART – B (5 x 10 = 50 Marks)

11 a) What are the allowances that are required to be given to a pattern to get casting of desired shape and dimensions? Explain about them in brief.   5
   b) Design a top riser with height equal to half the diameter for a steel section 100 mm x 50 mm x 20 mm.   5

12 a) Explain about investment casting process with a neat sketch.   5
   b) Explain the process of making plastic components by injection moulding process.   5

13 a) What are different types of flames in gas welding? How do you recognize them? What are their applications.   5
   b) Explain about friction welding process along with its advantages and limitations.   5

14 a) Explain about electro slag welding process with a neat sketch.   5
   b) What is Weldability? Discuss about various factors those decide weldability of a material.   5

..2

15 a) A homogeneous state of stress is defined by the following stress tensor.

$$\begin{bmatrix} 100 & 30 & 50 \\ 30 & 200 & 0 \\ 50 & 0 & -50 \end{bmatrix} \text{ MPa}$$

Find whether yielding occurs according to Von-Mise's criteria if yield strength of the material is 300 MPA. 5

b) Explain about explosive forming process with a neat sketch. 5

16 Discuss briefly about the following :
   a) Arc furnace 4
   b) Cold shut and Misrun 3
   c) Forward extrusion 3

17 Briefly describe the following :
   a) Chills 3
   b) Seam welding 3
   c) MEMS 4

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FACULTY OF ENGINEERING

B.E. 3/4 (Prod.) I - Semester (Main) Examination, December 2015

Subject : Metal Forming Technology

Time : 3 hours   **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1	What is meant by 'yield criteria"? Explain briefly.	3
2	Differentiate between cold working and hot working processes.	3
3	Define plastic anisotropy of a sheet metal.	2
4	How clearance is applied for punching operation? Explain briefly.	3
5	Explain the usage of mandrels in tube drawing operations.	2
6	Why do tubes buckle when bent? Explain briefly.	2
7	Mention the advantages and disadvantages of forging operations?	3
8	Explain the common defects that may occur during forging operations.	2
9	What do you mean by lagging and leading zones in rolling process?	3
10	Enlist various types of Rolling mills.	2

PART – B (5 x 10 = 50 Marks)

11 a)	Discuss the mechanism of plastic deformation of a ductile material.	5
b)	What is plasticity cycle? Explain with the help of a diagram.	5
12 a)	Explain the different types of presses that are used in sheet metal works.	5
b)	What is spring back? How it is related to thickness and bend radius of a sheet.	5
13 a)	Discuss the effect of friction on extrusion process.	5
b)	Explain the phenomenon of metal flow in extrusion process.	5
14 a)	Describe the wire drawing process with the help of a neat sketch.	5
b)	Discuss the important process variables in drawing a rod and wire.	5
15 a)	Classify the forging processes. Discuss any one with the help of a neat sketch.	5
b)	Explain the spinning operation with the help of a neat sketch.	5
16 a)	Explain the principle of cluster rolling mills with the help of a neat sketch.	5
b)	Discuss the significance of *roll speeds* and *roll gaps* on rolling operations.	5

17 Write short notes on any Two of the following :   2 x 5 = 10
   a) Progressive die
   b) Isotherma Forging
   c) Roll bending

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FACULTY OF ENGINEERING

B.E. 3/4 (AE) I – Semester (Main) Examination, December 2015

Subject : Production Technology

Time : 3 hours   **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1	Define allowance. Enlist types of pattern allowances.	2
2	Enlist casting defects.	2
3	Sketch a cluster roll mill and label its features.	2
4	What are the properties of cutting tool materials?	2
5	Differentiate between oblique cutting and orthogonal cutting.	2
6	Differentiate between soldering, brazing and braze welding.	3
7	Enlist atleast five work holding and tool holding devices in lathe.	3
8	State the principle of Tube drawing with neat sketch.	3
9	Plot Time Vs Pressure and Time Vs current graph for resistance spot welding.	3
10	Sketch Twist drill nomenclature.	3

PART – B (5 x 10 = 50 Marks)

11 a) Define Pattern. Explain different types of pattern with neat sketch.   5
   b) Differentiate between true centrifugal casting, semi centrifugal casting and
      centrifuging.   5

12 a) Explain the various modes of metal transfer in GMAW.   5
   b) Explain forge welding with neat sketch. State its advantages and disadvantages.   5

13 a) Differentiate between blow moulding and injection moulding.   5
   b) Explain with neat sketch machine forging. State its advantages and limitations.   5

14 a) Derive the relationship between shear angle, angle of friction and tool rake
      angle and hence sketch merchant circle.   5
   b) What are the functions of cutting fluids? State its characteristics. Name five
      cutting fluids.   5

15 a) Differentiate between Capstan and Turret lathe with sketches.   5
   b) Explain i) Knurling   ii) Slotting   iii) Milling   iv) Boring   5

16 With neat sketches write short notes on   a) Principle of Bending   5
   b) Spring back effect and methods to overcome it.   5

17 a) Explain with neat sketches Plasma Arc Welding   5
   b) Welding defects and remedies.   5

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FACULTY OF ENGINEERING

B.E. 3/4 (CSE) I - Semester (Main) Examination, December 2015

Subject : Design and Analysis of Algorithms

**Time : 3 hours**   **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1 What is meant by Halting Problem?   2
2 Differentiate Backtracking with branch and bound.   3
3 Define the terms direct recursive and indirect recursive algorithms.   2
4 Solve the recurrence relation   3

$$T(n) = T(1) \qquad n = 1$$
$$ = aT(n/b) + f(n) \quad n > 1$$

for a = 2, b = 2, T(1) = 2 and f(n) = n

5 State the optimal storage on multiple tapes problem.   2
6 Draw a degenerate tree.   2
7 Is dynamic programming better than greedy algorithm design technique? Justify?   3
8 Draw a comparision tree for sorting of three numbers A, B, C.   3
9 Differentiate NP-Hard with NP-complete problems.   3
10 Give an example of a biconnercted graph.   2

PART – B (50 Marks)

11 Find an optimal binary merge pattern for ten files whose lengths are 28, 32, 12, 5, 84, 53, 91, 35, 3 and 11 respectively.   10

12 Explain briefly   10
   a) Disjoint set union   b) Hash functions   c) Collision resolution techniques

13 Briefly explain any three NP-Hard graph problems.   10

14 What are Hamiltonian cycles? Present an algorithm that finds all the Hamiltonian cycles of a given graph.   10

15 Using dynamic programming approach, identify the articulation points in the graph below.   10
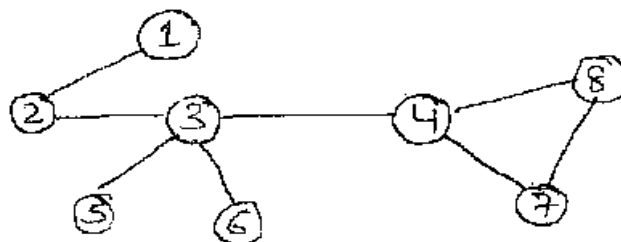
16 a) What is the solution generated by the greedy job scheduling algorithm for the instance where n = 7, $(p_1, p_2, \ldots, p_7) = (3, 5, 20, 18, 1, 6, 30)$ and $(d_1, d_2, \ldots, d_7) = (1, 3, 4, 3, 2, 1, 2)$.   5
    b) Explain asymptotic notations.   5

17 Answer any two :
    a) Reliability design   5
    b) Divide-and-conquer   5
    c) State space trees   5

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FACULTY OF INFORMATICS

B.E. 3/4 (IT) I - Semester (Main) Examination, December 2015

Subject : Theory of Automata

Time : 3 hours   **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1	Give a formal definition of NFA and its language.	3
2	What is an Epsilon-closure of a state? Give an example.	2
3	Write applications of regular expressions.	2
4	Give four operations that preserve the property of being a regular language.	2
5	Give a formal definition of CFG and write a grammar for production of palindromes over alphabet {0, 1}.	3
6	State reasons for ambiguity in grammars.	2

7 The following grammar generates prefix expressions with operomds x and y binary

operators +, -, and $*$:

$$E \rightarrow EE \mid * EE \mid - EE \mid x \mid y$$

Find left most and right most derivations, and a derivation tree for the string

$+*-xyxy$.   3

8 Explain instantaneous description for a PDA with an example.   3

9 Give a formal definition of nondeterministic Turing machine and give the name of the language it recognizes.   2

10 What are nondeterministic polynomial time problems? Give one example to explain.

3

PART – B (50 Marks)

11 Convert the following NFA to DFA by subset construction method.   10
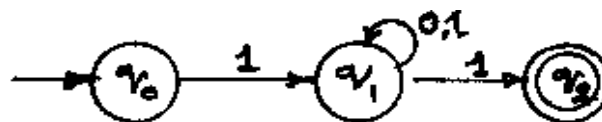
12 a) Write idempotent and closure laws of regular expressions.   4
   b) Illustrate the following :
      1) If L and M are regular language, then so is L $\cap$ M.
      2) If L is a regular language, than so is L*.   6

..2

13 a) For the PDA given below, show sequence of IDs leading to acceptance for input 000011. What is the stack content on acceptance? 5
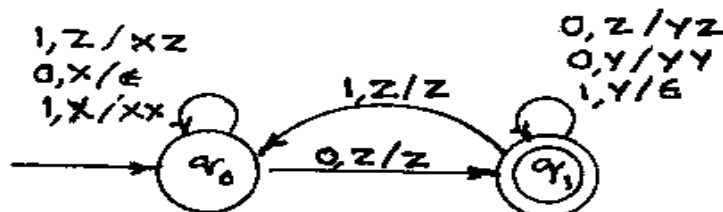
b) Give a formal definition of deterministic pushdown automata, and discuss the relationship between unambiguous CFGs and DPDAs. 5

14 Illustrate the simplification steps needed to generate Chomsky Normal form of CFL. 10

15 a) Explain the importance of TMs in the study of decidability. 3
b) Outline a strategy to implement a function 'multiplication' on TM starting with $0^m 10^n$ on its tape and ending with 0^{mn}. 7

16 a) Write a note on decidable problems and recursive languages. 6
b) State Rice's theorem and explain. 4

17 Write short notes on :
a) Structural induction 2
b) Languages and automata 3
c) Polynomial time bound problems and Halting of TMs 5

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