

Roll No. []

TCS-501

B. Tech. (CS) (Fifth Semester)

End Semester Back EXAMINATION, 2016

SYSTEM SOFTWARE

Time : Three Hours] [Maximum Marks : 100

Note : (i) This question paper contains five questions with alternative choice.

- (ii) All questions are compulsory.
- (iii) Each question carries four Parts (a), (b), (c) and (d). Attempt either Parts (a) and (b) or (c) and (d) of each question.
- (iv) Each Part carries ten marks. Total marks assigned to each question are twenty.

1. (a) Briefly describe a possible sequence of steps of a two pass assembler. What is a major difference between the creation of an Operation table and that of a symbol table ?
(b) Consider the following SIC/XE program which contains three program blocks as DEFAULT, CDATA and CBLKS. Find the object code for each instruction in the program. (OPCODEs are given

[2]

corresponding to mnemonics in the program).

TCS-501

ADDRESS	END4	START	0
0000	FIRST	STL (14)	RETADR
0003		JSUB (48)	RDREC
0006		LDA (00)	=C'EOF'
0009		COMP (28)	#0
000C		STA (0C)	BUFFER
		USE	CDATA
0000	RETADR	RESW	1
		USE	CBLKS
0000	BUFFER	RESB	4096
		USE	
000F	RDREC	CLEAR (B4)	X
0011		CLEAR (B4)	A
0013		TD (E0)	INPUT
		USE	CDATA
0003	INPUT	BYTE	X'F1'
0004	*	=C' EOF'	
		END	

Or

- Or*

(c) What is the role of pseudo instructions in assembler? Give the instruction formats and addressing modes of SIC machine architecture.

[3]

TCS-501

- (d) What is LEX ? Write the specification of file (test.1) for the LEX (you may assume C programming language for the purpose). Write the regular expression that describes a word that has a sequence of decimal digits followed by a dot and then another sequence of decimal digits. The word may optionally have a hyphen as a prefix. Give two examples of such words.

(a) What do you mean by Relocation ? Explain the different methods that are used to find a relocatable object program.

(b) Consider the following SIC program, apply the one pass assembler and show the content of the memory and the symbol table entries for the program after scanning line at address 2043.

Address	Source statement			Object Code
	EXAM	START	1000	
1000	EOF	BYTE	C'EOF'	454646
1003	THREE	WORD	3	000003
1006	ZERO	WORD	0	000000
1009	RETADR	RESW	1	
100C	LENGTH	RESW	1	
100F	BUFFER	RESB	4096	

200F	FIRST	STL	RETADR	141009
2012	CLOOP	JSUB	RDREC	48203D
2015		LDA	LENGTH	00100C
2018		COMP	ZERO	281006
201B		JEQ	ENDFIL	302024
201E		JSUB	WRREC	482062
2021		J	CLOOP	302012
2024	ENDFIL	LDA	EOF	001000
2027		STA	BUFFER	0C100F
202A		LDA	THREE	001003
202D		STA	LENGTH	0C100C
2030		JSUB	WRREC	482062
2033		LDL	RETADR	081009
2036		RSUB		4C0000
2039	INPUT	BYTE	X'F1'	F1
203A	MAXLEN	WORD	4096	001000
203D	RDREC	LDX	ZERO	041006
2040		LDA	ZERO	001006
2043	RLOOP	TD	INPUT	E02039
—	—	—	—	—
—	—	—	—	—
2062	WRREC	LDX	ZERO	041006
—	—	—	—	—
—	—	—	—	—

Assume the structure of the memory is as follows :

Memory Address	Contents
1000	454F4600 00030000 00xxxxxxxxxxxxxx
1010	
2000	
2010	
2020	
2030	
2040	

Or

- (c) Explain Literals, Keyword macro parameters and generation of unique labels in macroprocessing.
- (d) Assume the following code written for SIC machine. Which technique will you prefer to write the relocatable object program for this code ? Apply the answered technique and write the relocatable object program. (OPCODEs are given corresponding to mnemonics in the program).

0000	END3	START	0
0000	FIRST	STL(14)	RETADR 140033

Consider the following data :

(B) = 006000

(PC) = 003000

(X) = 000090

Memory contents :

3030	003600
	.
3600	103000
	.
6390	00C303
	.
C303	003030

4. (a) What do you mean by one pass assembler ? How forward referencing is handled in one pass assembler ? Explain.

- (b) Disassemble (convert object code back into assembly language) the following SIC/XE program. OPCODES are given as : LDA-00, LDX-04, ADDR-90, TIX-2C and JLT-38.

HPRG 00100000000E

T0010000E0100005000190102D000B3B2FF8

E001000

Or

- (c) What are the different operations that are performed in shift reduce parser ? Explain each operation with example.

- (d) Find the object code for each instruction given in the following SIC/XE program (OPCODEs are given corresponding to mnemonics in the program).

STRCP2	START	1000
FIRST	LDT (74)	#11
	LDX (04)	#0
MOVECH	LDCH (50)	STR1, X
	STCH (54)	STR2, X
	TIXR (B8)	T
	JLT (38)	MOVECH
STR1	BYTE	C'TEST STRING'
STR2	RESB	11
	END	FIRST

5. (a) What is system software ? Explain the different types of system softwares. Explain any *two* advantages of system software.

- (b) Write the output of the following program after macroprocessing.

EXAM	START	0
RED	MACRO	&INDEV, &BUFADR, &RECLTH

	CLEAR	X
	CLEAR	A
	+LDT	#4096
	TD	=X'&INDEV'
	STCH	&BUFADR,X
	STX	&RECLTH
	MEND	
WEB	MACRO	&OUTDEV, &BUFADR, &RECLTH
	CLEAR	X
	LDT	&RECLTH
	LDCH	&BUFADR,X
	TD	=X'&OUDEV'
	MEND	
FIRST	STL	RETADR
CLOOP	RED	F1, BUFFER, LENGTH
	LDA	LENGTH
	COMP	#0
	WED	05, EOF, THREE
	END	FIRST

Or

- (c) What is absolute loader ? Explain the different data structures that are used to implement the linking loader.
- (d) Give the object program for the following assembly code written in SIC. Indicate the

start and end of each object code in the object program by using ^ sign. (OPCODEs are given corresponding to mnemonics in the program).

EXAM	START	1000
	LDA (00)	ZERO
	STA (0C)	INDEX
ADDLP	LDX (04)	INDEX
	LDA (00)	ALPHA,X
	ADD (18)	BETA,X
	STA (0C)	GAMMA,X
	LDA (00)	INDEX
	ADD (18)	THREE
	STA (0C)	INDEX
	COMP (28)	K300
	JLT (38)	ADDLP
INDEX	RESW	1
ALPHA	RESW	100
BETA	RESW	100
GAMMA	RESW	100
ZERO	WORD	0
K300	WORD	300
THREE	WORD	3
	END	

B

Roll No.

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TCS-505

B. Tech. (CSE/IT) (Fifth Semester)

End Semester Back EXAMINATION, 2016

DESIGN ANALYSIS OF ALGORITHM

Time : Three Hours] [Maximum Marks : 100

- Note :** (i) This question paper contains *five* questions with alternative choice.
(ii) All questions are compulsory.
(iii) Each question carries four Parts (a), (b), (c) and (d). Attempt either Parts (a) and (b) or (c) and (d) of each question.
(iv) Each Part carries **ten** marks. Total marks assigned to each question are **twenty**.

1. : (a) Explain Masters theorem with the help of examples. What are Non-deterministic Algorithms ? Explain by giving examples.
(b) Solve the following recurrence :

$$T(n) = 2T(\sqrt{n}) + 1$$

Or

- (c) Among best first search and depth first search, which technique is used in inorder traversal of a binary tree and how ?

- (d) Apply Quick sort to solve the following elements and show all steps clearly :

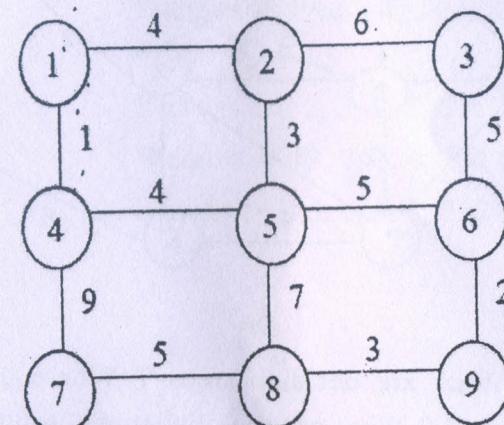
156, 12, 4, 91, 16, 2, 30, 10, 7, 45, 310

2. (a) What do you mean by "optimal substructure property" in dynamic programming ? How does the Greedy approach differ from dynamic programming approach ? Show with examples.
- (b) Write pseudocode for Merge Sort and prove mathematically that complexity of merge sort is $O(n \log n)$.

Or

- (c) Mention two specific features of Dijkstra's algorithm that makes it a greedy algorithm. Find order of complexity of function $f(n) = 2 * f(n - 1) + 5$ with initial condition of $f(1) = 1$.
- (d) Write an algorithm to find median and mode from a list of 'n' elements. The Dijkstra's algorithm does not work for negative weight path. Why ?
3. (a) Write pseudo code for Binary Search and mathematically prove its complexity.
- (b) Write pseudo code for Kruskal's algorithm and explain it. Find the minimum cost of the spanning tree by Prim's algorithm for the

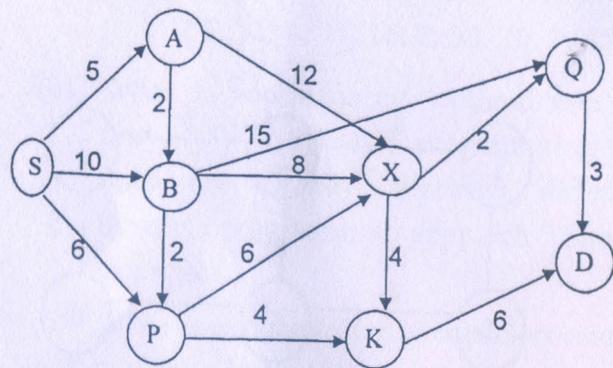
given figure below, and show all the necessary steps as per the algorithm.



Or

- (c) Explain Defective Chess Board Problem. Explain Hamiltonian Circuit problem with the help of an example.
- (d) Apply Count sort in the following array : $A = < 6, 2, 6, 5, 2, 4, 0, 6, 4, 5 >$ and show all steps.
4. (a) Explain Depth First Search Algorithm with Pseudo code. What is the running time of DFS ? Show how DFS can be used to perform a topological sort of a directed acyclic graph.

- (b) For the following graph find the shortest path from S to D using Dijkstra's algorithm and show the updated path.



Or

- (c) What are decision trees ? Where are they used ? What are the challenges in numerical algorithms ?
- (d) Write Pseudo code for Floyd's algorithm and solve the following showing each step clearly using All pairs shortest path. For the given Weight matrix below, design graph and show updated optimal paths.
5. (a) Explain Horspool's algorithm with the help of an example.
- (b) Explain N-Queens problem. For a 4×4 chessboard find all the possible solutions using N-Queens problem where $N = 4$.

Or

- (c) Define with the help of proper examples the Classes of P, NP, NP complete and NP hard problems.
- (d) Find the optimal solution for the 0/1 Knapsack Problem, capacity of knapsack $W = 8$:
- Items = $< 1, 2, 3, 4, 5, 6 >$
 Weights = $< 3, 2, 3, 4, 2, 2 >$
 Benefits = $< 5, 6, 8, 4, 7, 9 >$

B

Roll No.

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TPE-504

B. Tech. (Petroleum Engg.) (Fifth Semester) End Semester Back EXAMINATION, 2016

GEOCHEMICAL PROSPECTING METHOD

Time : Three Hours] [Maximum Marks : 100

Note : (i) This question paper contains five questions with alternative choice.
(ii) All questions are compulsory.
(iii) Each question carries four Parts (a), (b), (c) and (d). Attempt either Parts (a) and (b) or (c) and (d) of each question.
(iv) Each Part carries ten marks. Total marks assigned to each question are twenty.

1. (a) How the production and accumulation of organic matter take place ? Discuss.
(b) What are the sources of organic matter ? Discuss.

Or

- (c) Regressive cycle is less important than transgressive cycle for source rock generation. Discuss.

- (d) What are the aerobic and anaerobic bacteria ? What role do they play in transforming organic matter into petroleum ?
2. (a) Write short notes on the following :
- (i) Humic organic matter
 - (ii) Sapropelic organic matter
- (b) Explain the following :
- (i) Van Krevelen Diagrams
 - (ii) West Texas Intermediate Oil
- Or*
- (c) What are different types of kerogen ? Discuss.
- (d) Explain the following :
- (i) Water washing
 - (ii) Brent blend crude oil
3. (a) What is TOC ? What are the indirect methods of knowing the TOC of a rock ?
- (b) What are the advantages and disadvantages of direct method of TOC determination. Discuss.
- Or*
- (c) Write short notes on the following :
- (i) Heteroatom in oil
 - (ii) Cracking of oil
- (d) Explain the following :
- (i) Diagenesis of organic matter
 - (ii) Oil window

4. (a) What is secondary migration. What are the main factors affecting secondary migration of oil ? Discuss.
- (b) Discuss how the composition of oil and gas change due to migration of oil ?
- Or*
- (c) What is geochemical correlation in petroleum exploration ? Discuss source Rock-Crude Oil correlation method.
- (d) Discuss the classification of crude oil.
5. (a) What are the methods of evaluating thermal maturity of organic matter ?
- (b) Calculate present day TTI for a rock at 3000 m in a Well using both maximum and minimum scenarios for Tertiary removal :

Time stratigraphic data	
Age (my)	Depth (m)
30	0
38	300
65	1400
80	1700
100	3000

Erosional removal is estimated to have begun about 5 mya and probably comprises between 500 and 2000 m :

Temperature data

Present-day average surface temperature : 10°C

Corrected BHT (3000 m) : 70°C

Or

- (c) What is Pyro method of source rock evaluation for maturity ? What are the advantages and disadvantages of Pyrolysis ? Discuss.
- (d) Explain the following in connection with maturity of organic material :
 - (i) Vitrinite Reflectance
 - (ii) Conodont Alteration Index.

B

Roll No.

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TPE-505

B. Tech. (Petroleum Engg.)
(Fifth Semester) End Semester

Back EXAMINATION, 2016
PETROLEUM RESERVOIR AND
PRODUCTION ENGINEERING

Time : Three Hours] [Maximum Marks : 100

Note : (i) This question paper contains *five* questions with alternative choice.
(ii) All questions are compulsory.
(iii) Each question carries four Parts (a), (b), (c) and (d). Attempt either Parts (a) and (b) or (c) and (d) of each question.
(iv) Each Part carries **ten** marks. Total marks assigned to each question are **twenty**.

1. (a) What do you understand by reservoir rock ? Explain it on the basis of different structural parameters.
- (b) What do you understand by reservoir pore spaces and pore fluids ?

Or

- (c) Based on the geological formation what are the different types of reservoirs ?

- (d) Explain the migration of hydrocarbon from the point of origin to the reservoir rocks.
2. (a) Explain the effect of textural parameters on the permeability of the reservoir rocks.
- (b) Calculate the volumetric average porosity of the following data :

Sample	Thickness, ft	Area , ft^2	$\phi\%$
1	2	4.2	15
2	3	5.0	11
3	6.5	3.8	17
4	4.7	2.5	9

Use the volume average porosity for estimating the total oil content of the reservoir having the surface area of 4356000 ft^2 . The thickness and oil saturation are 100 ft. and 25% respectively.

Or

- (c) Explain the different parameter affecting the porosity of the system.
- (d) Calculate the effective porosity for the following set of data :

Weight of dry sample in air = 20.0 g

Weight of dry sample coated
with paraffin = 20.9 g (density
of paraffin is 0.9 g/ml)

$$\begin{array}{ll} \text{Weight of coated sample} & \\ \text{immersed in water} & = 10 \text{ g} \\ \text{Weight of sample saturated} & \\ \text{with water in air} & = 22.5 \text{ g} \end{array}$$

3. (a) What do you understand by capillary pressure ? Derive the expression for the estimation of pressure inside the capillary of radius "r".
- (b) Explain the effect of wettability on the distribution of hydrocarbon in the reservoir. Write Timur and Morris Biggs equation relating permeability and porosity of the reservoir rock.

Or

- (c) Calculate the effective permeability for linear and parallel system whose permeability are given below.

Bed	Pay Thickness, ft.	Permeability, md
1	400	25
2	250	50
3	650	100
4	800	200

- (d) What do you understand by capillary hysteresis ? Explain it with the help of a neat diagram.

4. (a) Define the term productivity index ? Explain the factors affecting Productivity index.
(b) Explain the Darcy law and Fluid Potential. What are the assumption of Darcy law for fluid flow ?

Or

- (c) On the basis of reservoir geometry explain the different types of flow occurring in the reservoir.
(d) Explain the radial pressure profile of the well in the presence of skin.
5. (a) What do you understand by the field development principles ? Explain.
(b) Briefly explain the different methods of EOR.

Or

- (c) Classify the reservoir on the basis of physical properties and composition of crude oil.
(d) Derive the Material Balance equation and explain recovery factor.

Or

- (c) Write in detail about "Software Project Management Spectrum" ? Explain the concept of 4 P's in SPM.
 - (d) Describe why scheduling in a project is mandatory. Describe any of the scheduling tools with the help of suitable diagram.
2. (a) What do you mean by the term Risk in software ? Explain Risk identification and risk refinement along with risk mitigation.
- (b) Explain Evolving role of software. Also elaborate the recent software development now-days. Also explain why the software is called as vehicle to run the software.
- Or*
- (c) Write a short note on software development life cycle. Differentiate between onsite observation and presentation.
 - (d) What do you mean by the term implementation ? What are the various methods to finally implement the software at customer's site ?
3. (a) Write in detail about Program Evaluation Review Technique (PERT). Also explain Critical Path Method (CPM) with example.

- (b) What do you mean by cost-benefit analysis ? What are the various categories of cost required to estimate the cost of the software product.

Or

- (c) What are the various dimensions of Project Monitoring and Control ? Explain in detail.
 - (d) What do you mean Software Reviews ? What are various categories of Software Reviews ? What is the requirement of Software Reviews ?
4. (a) Describe ISO 9001 Standards ? Discuss the advantages of implementing ISO 9001.
- (b) What are test cases ? How are these generated ? Explain their importance in software development.
- Or*
- (c) What is estimation ? Explain its role in S/W planning. Explain any one cost estimation model with its merits and demerits.
 - (d) What is verification ? How is it different from validation ? Explain through an example.
5. (a) Differentiate Equivalence Class Partitioning and Boundary Value Analysis Techniques with the help of an example.

- (b) Define and describe the term debugging along with some famous debugging techniques.

Or

- (c) Explain CASE tools, with their relevance and importance in Software Development.
- (d) What do you mean by Component Based Development ? Explain in your own words.

Roll No.

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TEC-504

B. Tech. (ECE) (Fifth Semester) End Semester Back EXAMINATION, 2016

ANTENNA AND WAVE PROPAGATION

Time : Three Hours] [Maximum Marks : 100

- Note : (i) This question paper contains five questions with alternative choice.
- (ii) All questions are compulsory.
 - (iii) Each question carries four Parts (a), (b), (c) and (d). Attempt either Parts (a) and (b) or (c) and (d) of each question.
 - (iv) Each Part carries ten marks. Total marks assigned to each question are twenty.

1. (a) What do you mean by radiation pattern of an antenna ? Describe major lobe, minor lobe and side lobe, back lob-HPBW and FNBW with the help of neat diagram.
 - (b) Find FNBW and HPBW of the following pattern :
 - (i) $E(\theta) = \cos^2 \theta$ for $0^\circ \leq \theta \leq 90^\circ$
 - (ii) $P(\theta) = \cos^2 \theta$ for $0^\circ \leq \theta \leq 90^\circ$
- Also plot pattern (normalized).

Or

- (c) Define radiation pattern, gain and directivity of an antenna. Also give the relation among D, G and η .
 - (d) Given $E_n = \sin \theta \sqrt{\sin^3 \phi}$ where, $0^\circ \leq \theta \leq \pi$ and $0^\circ \leq \phi \leq \pi$; then find :
 - (i) Exact directivity
 - (ii) Approximated directivity
 - (iii) Difference between two
2. (a) (i) Define Fresnel and Fraunhofer field. Also give their ranges with neat sketch.
- (ii) Write the types of antenna according to their pattern.
- (b) If radiated power density of an antenna is :

$$\vec{W}_{\text{rad}} = A_0 \frac{\sin^2 \theta}{r^2} \hat{a}_r, \text{ W/m}^2$$

where θ is the usual spherical co-ordinate :

- (i) Find maximum directivity of the antenna
- (ii) Determine the directivity as a function of the directional angle θ and ϕ .

Or

- (c) If we have obtained :

$$A_z = \frac{\mu}{4\pi r} I_{\text{dl}} \cos \omega \left(t - \frac{r}{c} \right),$$

find the expression for far field H_ϕ due to an Alternating current element (oscillating dipole).

- (d) If :

$$H_\phi = \left(\frac{jI_m}{2\pi r} \right) \left(e^{-j\beta r} \right) \left(\frac{\cos \left(\frac{\pi}{2} (\cos \theta) \right)}{\sin \theta} \right)$$

for a half wave dipole, find the expression of power radiated by the half wave dipole and its radiation resistance.

3. (a) Derive the expression for maximum effective aperture of an alternative current element by using the exact value of intrinsic impedance and proper formula of radiation resistance.
- (b) Define retarded potential and Lorentz Gauge condition. For a source (J, ρ) in a medium whose properties are represented by μ, ϵ and σ . Starting with Maxwell's equation in phaser form, derive the differential equation :

$$\nabla^2 \vec{A} - \mu \epsilon \frac{\partial^2 \vec{A}}{\partial t^2} = -\mu \vec{J}$$

Or

- (c) Explain the Yagi-Uda antenna with its design considerations.
- (d) Why do we use folded dipole antenna ? Derive the input impedance of two wire folded dipole antenna.

4. (a) What are Broadside array and end fire array ? Derive the array factor of n-element linear array of uniform amplitude and spacing.
(b) Derive an expression for directivity of n element uniform linear array for BSA.

Or

- (c) Discuss the geometry of horn antenna and calculate the directivity and power gain of an optimum horn antenna whose one side of square aperture is $a = 25\lambda$.
(d) What are the beam mode and normal mode of radiation in a helical antenna ? For a 30 turn helical antenna operating at 4 GHz with circumference $\pi D = 20$ cm and spacing between turns 0.6λ . Calculate the directivity and HPBW of the antenna.
5. (a) Give comparison among the modes of radio wave propagation.
(b) Explain the sky wave propagation. Give the structure of the different ionosphere layers. Also give their characteristics.

Or

- (c) What do you mean by maximum usable frequency and skip distance ? Give the relationship between MUF and critical frequency.
(d) What is space wave propagation ? If the heights of transmitting and receiving antennas are given, derive the expression for the maximum radio ranged d_{max} .

B

Roll No.

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TAE-504

B. Tech. (AME) (Fifth Semester)

End Semester Back EXAMINATION, 2016

AUTOMOTIVE TRANSMISSION

Time : Three Hours] [Maximum Marks : 100

- Note :** (i) This question paper contains *five* questions with alternative choice.
(ii) All questions are compulsory.
(iii) Each question carries four Parts (a), (b), (c) and (d). Attempt either Parts (a) and (b) or (c) and (d) of each question.
(iv) Each Part carries **ten** marks. Total marks assigned to each question are **twenty**.

1. (a) What do you understand by automotive transmission ? Explain.
(b) Discuss requirement of various components in an automotive transmission system.

Or

- (c) What is a clutch ? Explain its functions in an automobile with neat diagram.

- (d) Discuss construction and working of a single plate clutch system.
2. (a) What is clutch adjustment ? Explain its importance in detail.
- (b) Compare between electromagnetic clutch with friction clutch in detail.

Or

- (c) Discuss the working and applications of centrifugal clutch system.
- (d) Write a note on materials used for clutch facing/lining.
3. (a) What is an automatic transmission ? Discuss its requirements in automobile.
- (b) Compare between automatic transmission and conventional transmission.

Or

- (c) Discuss principle and importance of electric drive in detail.
- (d) With the help of general arrangement, discuss electric transmission system.
4. (a) Discuss advantages and limitations of fluid coupling.
- (b) Explain construction and working of fluid coupling in detail.

Or

- (c) Discuss advantages and limitations of torque convertor.
- (d) Explain construction and working of torque convertor in detail.

5. (a) What is an automotive gear box ? Explain its need and functions in detail,
- (b) How automotive gears are manufactured ? Discuss their material and one manufacturing process.

Or

- (c) Compare between constant mesh and sliding mesh type gear box in detail.
- (d) Discuss construction and working of epicyclic transmission in detail.

B
Roll No.

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TME-504

B. Tech. (ME) (Fifth Semester)
End Semester Back EXAMINATION, 2016

FLUID MECHANICS

Time : Three Hours] [Maximum Marks : 100

Note : (i) This question paper contains *five* questions with alternative choice.
(ii) All questions are compulsory.
(iii) Each question carries four Parts (a), (b), (c) and (d). Attempt either Parts (a) and (b) or (c) and (d) of each question.
(iv) Each Part carries ten marks. Total marks assigned to each question are **twenty**.

1. (a) Define the terms poise and stokes and derive expression for their dimensions in terms of M, L, and T.
- (b) A glass tube of 2 mm internal diameter is immersed in oil of mass density 950 kg/m^3 to a depth of 12 mm. If the oil has a surface tension of 0.036 N/m, what pressure is needed in the formation of a just released bubble ?

[2]

TME-504

Or

- 1) What is pressure head ? How pressure can be expressed in terms of height of a liquid column ?
- (d) A body has the cylindrical upper portion 2 m diameter and 1.2 m deep. The lower portion which is curved displaces the volume of 0.4 m^3 of water, and its centre of buoyancy is situated 1.3 m below the top of the cylinder. The centre of gravity of the whole unit is 80 cm below the top of the cylinder and the total displacement is 2.6 m^3 . Find the metacentric height.
2. (a) Explain the significance of dimensional analysis as applied to fluid flow problems.
- (b) A 1 : 50 scale model of proposed dam is used to predict prototype flow conditions. If the design flood discharge over the spillway is $12000 \text{ m}^3/\text{s}$, what water flow rate should be established in the model to simulate this flow ? Also if a velocity of 1.25 m/s is measured at a point in the model, what is the velocity at a corresponding point in the prototype ?

Or

- (c) Differentiate between the Eulerian and Lagrangian method of representing fluid motion.

[3]

TME-504

- (d) Derive an expression for fluid rotation in a 2-D flow. The stream function and velocity potential function for a certain flow have been indentified as

$$\psi = 2xy \text{ and } \phi = x^2 - y^2$$

Show that the conditions of continuity and irrotational flow are satisfied.

3. (a) Derive Euler's equation of motion along a streamline, and hence derive the Bernoulli's theorem.
- (b) An orifice in the side of a large tank is rectangular in shape, 2 m broad and 1 m deep. The water level on one side of the orifice is 3 m above the top edge and water level on the other side is 50 cm below the top edge. Find the discharge passing through the orifice if $C_d = 0.62$ for free portion and $C_d = 0.6$ for the drowned portion.

Or

- (c) Describe Reynolds experiment to demonstrate the laminar and turbulent fluid flows. How is the type of flow related to Reynolds number ?
- (d) Derive the HagenPoiseulle equation and state the assumption made.

4. (a) Define the following terms :
- Intensity and scale of turbulence
 - Isotropic and homogenous turbulence
 - Kinetic energy of turbulence
- (b) Explain the total energy line and the hydraulic gradient liner for fluid flow through a piping system.

Or

- (c) Explain boundary layer separation and its control.
- (d) Find the displacement thickness, momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $u/U = y/\delta$, where u is the velocity at a distance y from the plate and $u = U$ at $y = \delta$, where δ is boundary layer thickness.

Also calculate the value of δ^*/θ .

5. (a) What are major energy losses ? Calculate it by using Darcy-Weisbach formula.
- (b) A smooth pipeline 7.5 cm in diameter and 500 m long conveys water at the rate of $0.075 \text{ m}^3/\text{s}$. Determine the loss and of head, wall shear stress, centerline velocity and nominal thickness of laminar sublayer. For water $\rho = 1000 \text{ kg/m}^3$ and $\nu = 0.0195 \text{ stokes}$.

Or

- (c) Define drag and lift and drag-coefficient and lift-coefficient. Differentiate between friction drag and pressure drag. Under what circumstances friction drag becomes zero and pressure drag become zero ?
- (d) A kite of dimensions $0.7 \text{ m} \times 0.7 \text{ m}$ and weighting 6 N assumes an angle of 8° to the horizontal, and the string attached to the kite makes an angle of 45° to the horizontal. The pull on the string is 25 N when the wind is blowing at a speed of 40 km/hr. Find the lift and drag forces and the corresponding lift and drag coefficients. The density of air is given as 1.2 kg/m^3 .

Roll No. []



THM-502

B. Tech. (EN) (Fifth Semester)

End Semester Back EXAMINATION, 2016

STRATEGIC INFORMATION

MANAGEMENT SYSTEM

Time : Three Hours] [Maximum Marks : 100

Note : (i) This question paper contains five questions with alternative choice.

(ii) All questions are compulsory.

(iii) Each question carries four Parts (a), (b), (c) and (d). Attempt either Parts (a) and (b) or (c) and (d) of each question.

(iv) Each Part carries ten marks. Total marks assigned to each question are twenty.

1. (a) What is the nature and scope of operations research in decision-making ? Explain.
- (b) Define role of personality in organization behaviour.

Or

- (c) Explain the role of manager for goal setting in an organization.

- (d) Define Slack, Surplus and Artificial Variable.
2. (a) Define feasible solution and feasible region for solving Linear Programming problem.
- (b) Solve Linear Programming problem by graphical method :

Minimize :

$$z = 0.4 x_1 + 0.5 x_2$$

Subject to :

$$0.3 x_1 + 0.1 x_2 \leq 2.7$$

$$0.5 x_1 + 0.5 x_2 = 6$$

$$0.6 x_1 + 0.4 x_2 \geq 6$$

Or

- (c) What steps are required in solving LPPs by graphic method ? Discuss in brief.
- (d) Solve Graphically :

Maximize :

$$z = x_1 + x_2 / 2$$

Subject to :

$$3x_1 + 2x_2 \leq 12$$

$$5x_1 \leq 10$$

$$x_1 + x_2 \leq 8$$

$$-x_1 + x_2 \geq 4$$

3. (a) What is an assignment problem ? Also explain the types of an assignment problem.
- (b) A company has factories at F1, F2 and F3 which supply to warehouses at W1, W2 and W3. Weekly factory capacities are 200, 180, 120 and 150 units respectively. Unit shipping costs (in rupees) are as follows :

	Warehouse			
	W1	W2	W3	Supply
Factory	16	20	12	200
	14	8	18	160
	26	24	16	90
Demand	180	120	150	450

Determine the optimal distribution for this company to minimize total shipping cost.

Or

- (c) Explain Organization Behaviour responding to global and cultural diversity.
- (d) Solve the following question by Big M method :

Min. :

$$z = 3x_1$$

Subject to :

$$2x_1 + x_2 \geq 6$$

$$3x_1 + 2x_2 = 4$$

$$x_1, x_2 \geq 0$$

4. (a) Explain the scope and purpose of operations research and its usefulness to the firm. Give some examples of the applications of OR in industry.
- (b) Draw a network diagram of the project that shows which activities follow which other ones :

Activity	Description	Required Predecessor	Duration
A	Product design	(None)	5 months
B	Market research	(None)	1
C	Production analysis	A	2
D	Product model	A	3
E	Sales brochure	A	2
F	Cost analysis	C	3
G	Product testing	D	4
H	Sales training	B, E	2
I	Pricing	H	1
J	Project report	F, G, I	1

Or

- (c) What is an assignment problem ? Also explain the types of an assignment problem.

- (d) Find the optimal transportation cost of given transportation problem, first find initial feasible solution.

	Shipping cost per truckload	Warehouse				Output
		1	2	3	4	
Cannery	1	464	513	654	867	75
	2	352	416	690	791	125
	3	995	682	388	685	100
Requirement		80	65	70	85	

5. (a) Draw and explain various kinds of organizational structures.
 (b) Solve the following Assignment problem by Hungarian method.

Person	Job			
	1	2	3	4
A	20	25	22	28
B	15	18	23	17
C	19	17	21	24
D	25	23	24	24

Or

- (c) What do we understand by strategic decision-making ?

- (d) A small maintenance project consists of the following jobs whose precedence relationships is given below :

Job	Duration (Days)
1—2	15
1—3	15
2—3	3
2—5	5
3—4	8
3—6	12
4—5	1
4—6	14
5—6	3
6—7	14

- (i) Draw a network diagram representing the project.
(ii) Find the critical path and total project duration.

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TCE-503

B. Tech. (Civil Engg.) (Fifth Semester)
End Semester Back EXAMINATION, 2016

GEOTECHNICAL ENGINEERING-II

Time : Three Hours] [Maximum Marks : 100

Note : (i) This question paper contains five questions with alternative choice.
(ii) All questions are compulsory.
(iii) Each question carries four Parts (a), (b), (c) and (d). Attempt either Parts (a) and (b) or (c) and (d) of each question.
(iv) Each Part carries ten marks. Total marks assigned to each question are twenty.
(v) Put the values of N_c : 65.4, N_q : 49.4, N_y : 54.0.

1. (a) Explain the planar failure surface on the bases of Culmann's method.
(b) What will be the maximum safe load for square footing 2.5 m * 2.5 m with depth of base of footing is 1.5 m below, the ground surface. If the soil is loose sand of unit weight 16 kN/m³ and angle of shearing resistance is 25°. With factor of safety = 3.

Or

- (c) Explain the Meyerhof's analysis with neat diagram.
- (d) Plate load test were conducted in a C- φ soil, on plates of two different sizes and the following results were obtained :

Load	Size of the Plate	Settlement
40 kN	0.3 m * 0.3 m	25 mm
100 kN	0.6 m * 0.6 m	25 mm

2. (a) Explain the different settlements of footings.
- (b) A square footing located at a depth of 1.3 m below the ground level 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.

Void ratio = 0.5; Degree of saturation = 50%, specific gravity = 2.67; $c = 8 \text{ kN/m}^2$; $\varphi = 30^\circ$

Or

- (c) Explain the case of analysis of soil slope for the cohesive soil for bulk, submerged slope.
- (d) What is the ultimate bearing capacity of a circular footing of 1.5 m diameter resting on the surface of saturated clay of unconfined compressive strength of 100 kN/m^2 . What is the safe value, if the factor of safety is 3 ?

3. (a) Specialization of Terzaghi's equation with different shape factors.
- (b) A rectangular footing 2 m * 3 m rests on C- φ soil, with its base at 1.5 m below the ground surface. Calculate the safe bearing capacity, using a factor of safety of 3 on :
- Ultimate bearing capacity.
 - Net ultimate bearing capacity.
- The soil has the following parameters :
- $$c = 10 \text{ kN/m}^3 \text{ and } \gamma = 18 \text{ kN/m}^3 \text{ and } \varphi = 30^\circ.$$
- (Solve by Terzaghi's analysis)

Or

- (c) Explain the standard penetration test with complete correction.
- (d) A footing 3 m * 1.5 m in plan transmits a pressure of 160 kN/m^2 on a cohesive soil having $E = 8 \times 10^4 \text{ kN/m}^2$ and $\mu = 0.48$. Determine the immediate settlement at the centre, assuming the footing to be rigid footing.
4. (a) Explain the load carrying capacity of a pile by Dynamic formulae.
- (b) A new canal is excavated at a depth of 5 m below the ground surface through a soil having the following characteristics;

$c = 14 \text{ kN/m}^2$; $\varphi = 30$ and $G = 2.70$. The slope of the bank is 1:1.

Calculate the factor of safety with respect to cohesion when the canal is full.

Or

- (c) Explain the methods of site exploration.
 - (d) A slope is to be constructed at an inclination of 30° with the horizontal. Determine the safe height of the slope at factor of safety of 1.5. The soil has the following properties : $c = 15 \text{ kN/m}^3$, $\varphi = 22.5^\circ$ and $\gamma = 19 \text{ kN/m}^3$.
5. (a) Explain the different methods of stabilization of soils.
- (b) In a 16 pile group, the pile diameter is 45 cm and center to centre spacing of the square group is 1.5 m. If $c = 50 \text{ kN/m}^2$, whether the failure would occur with the pile acting individually, or as a group ? Neglect bearing at the tip of the pile. All pile are 10 m long.
Taken $m = 0.7$.

Or

- (c) Explain the under reamed pile foundations with neat diagram.
- (d) A strip footing 2.5 m wide carries a load intensity of 400 kN/m^2 at a depth of 1.2 m in sand. The saturated unit weight of sand is

19.5 kN/m^3 and unit weight above the water table is 16.8 kN/m^3 . The shear strength parameters are $C = 0$, $\varphi = 35^\circ$. Determine the factor of safety with the respect to shear failure for the location of water table :

- (i) Water table is 4 m below G. L.
- (ii) Water table is just at the base of the footing.
- (iii) Water table is 2.5 m below the ground level.

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TCE-503

B. Tech. (Civil Engg.) (Fifth Semester)
End Semester Back EXAMINATION, 2016

GEOTECHNICAL ENGINEERING-II

Time : Three Hours] [Maximum Marks : 100

Note : (i) This question paper contains five questions with alternative choice.
(ii) All questions are compulsory.
(iii) Each question carries four Parts (a), (b), (c) and (d). Attempt either Parts (a) and (b) or (c) and (d) of each question.
(iv) Each Part carries ten marks. Total marks assigned to each question are twenty.
(v) Put the values of N_c : 65.4, N_q : 49.4, N_y : 54.0.

1. (a) Explain the planar failure surface on the bases of Culmann's method.
(b) What will be the maximum safe load for square footing 2.5 m * 2.5 m with depth of base of footing is 1.5 m below, the ground surface. If the soil is loose sand of unit weight 16 kN/m³ and angle of shearing resistance is 25°. With factor of safety = 3.

Or

- (c) Explain the Meyerhof's analysis with neat diagram.
- (d) Plate load test were conducted in a C- φ soil, on plates of two different sizes and the following results were obtained :

Load	Size of the Plate	Settlement
40 kN	0.3 m * 0.3 m	25 mm
100 kN	0.6 m * 0.6 m	25 mm

- 2. (a) Explain the different settlements of footings.
- (b) A square footing located at a depth of 1.3 m below the ground level 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.

Void ratio = 0.5; Degree of saturation = 50%, specific gravity = 2.67; $c = 8 \text{ kN/m}^2$; $\varphi = 30^\circ$

Or

- (c) Explain the case of analysis of soil slope for the cohesive soil for bulk, submerged slope.
- (d) What is the ultimate bearing capacity of a circular footing of 1.5 m diameter resting on the surface of saturated clay of unconfined compressive strength of 100 kN/m^2 . What is the safe value, if the factor of safety is 3 ?

- 3. (a) Specialization of Terzaghi's equation with different shape factors.
- (b) A rectangular footing 2 m * 3 m rests on C- φ soil, with its base at 1.5 m below the ground surface. Calculate the safe bearing capacity, using a factor of safety of 3 on :
 - (i) Ultimate bearing capacity.
 - (ii) Net ultimate bearing capacity.

The soil has the following parameters :

$$c = 10 \text{ kN/m}^2 \text{ and } \gamma = 18 \text{ kN/m}^3 \text{ and } \varphi = 30^\circ.$$

(Solve by Terzaghi's analysis)

Or

- (c) Explain the standard penetration test with complete correction.
- (d) A footing 3 m * 1.5 m in plan transmits a pressure of 160 kN/m^2 on a cohesive soil having $E = 8 \times 10^4 \text{ kN/m}^2$ and $\mu = 0.48$. Determine the immediate settlement at the centre, assuming the footing to be rigid footing.
- 4. (a) Explain the load carrying capacity of a pile by Dynamic formulae.
- (b) A new canal is excavated at a depth of 5 m below the ground surface through a soil having the following characteristics;

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Calculate the factor of safety with respect to cohesion when the canal is full.

Or

- (c) Explain the methods of site exploration.
 - (d) A slope is to be constructed at an inclination of 30° with the horizontal. Determine the safe height of the slope at factor of safety of 1.5. The soil has the following properties : $c = 15 \text{ kN/m}^3$, $\varphi = 22.5^\circ$ and $\gamma = 19 \text{ kN/m}^3$.
5. (a) Explain the different methods of stabilization of soils.
- (b) In a 16 pile group, the pile diameter is 45 cm and center to centre spacing of the square group is 1.5 m. If $c = 50 \text{ kN/m}^2$, whether the failure would occur with the pile acting individually, or as a group ? Neglect bearing at the tip of the pile. All pile are 10 m long. Taken $m = 0.7$.

Or

- (c) Explain the under reamed pile foundations with neat diagram.
- (d) A strip footing 2.5 m wide carries a load intensity of 400 kN/m^2 at a depth of 1.2 m in sand. The saturated unit weight of sand is

19.5 kN/m^3 and unit weight above the water table is 16.8 kN/m^3 . The shear strength parameters are $C = 0$, $\varphi = 35^\circ$. Determine the factor of safety with the respect to shear failure for the location of water table :

- (i) Water table is 4 m below G. L.
- (ii) Water table is just at the base of the footing.
- (iii) Water table is 2.5 m below the ground level.

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TCE-505

B. Tech. (CE) (Fifth Semester) End Semester Back EXAMINATION, 2016

STRUCTURAL ANALYSIS-II

Time : Three Hours] [Maximum Marks : 100

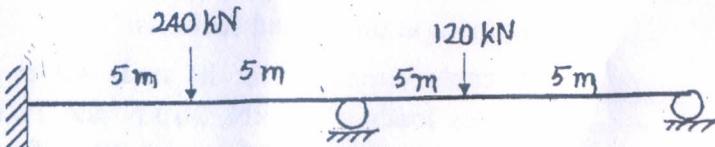
- Note : (i) This question paper contains five questions with alternative choice.
- (ii) All questions are compulsory.
- (iii) Each question carries four Parts (a), (b), (c) and (d). Attempt either Parts (a) and (b) or (c) and (d) of each question.
- (iv) Each Part carries ten marks. Total marks assigned to each question are twenty.

1. (a) A two-hinged parabolic arch of span 18 m and rise 3.60 m carries two concentrated loads of 25 kN each at the crown and at the left quarter span section. Find the horizontal thrust at each support and the bending moment at the loaded sections.
- (b) A cable supported at its ends 40 m apart carries loads of 20 kN, 20 kN and 12 kN at distances of 10 m, 20 m and 30 m from the

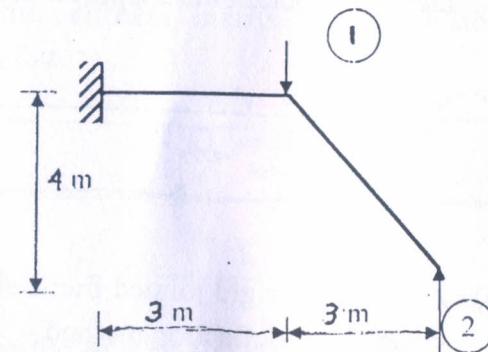
left end. If the point on the cable where the 10 kN load is supported is 13 m below the level of the end supports, determine (i) the reactions at the supports, (ii) the tensions in the different parts of the cable.

Or

- (c) Find the horizontal thrust in a two-hinged parabolic arch of span 'L' and central rise 'h', due to a concentrated load 'W' at a distance of 'KL' from the left support. Assume $I = I_0 \sec \theta$.
 - (d) The stiffening girder of a suspension bridge of span 120 m has hinges at the ends and at mid-span. The cable is suspended between two spans separated horizontally by 120 m and vertically by 10 m. The maximum dip of the cable is 10 m below the lower suspension point. Draw the shear force and bending moment diagram for the girder due to concentrated load of 180 kN acting at the central hinge.
2. (a) Analyse the continuous beam shown below using flexibility method.

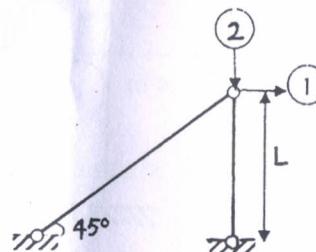


- (b) Obtain the flexibility matrix for the rigid jointed plane frame shown below with respect to the coordinate system shown.

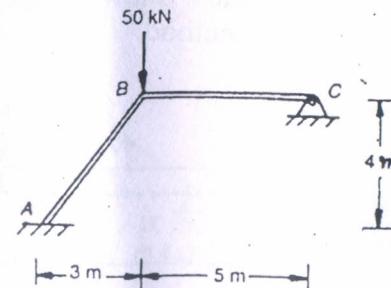


Or

- (c) Derive the flexibility matrix for the truss structure shown below.



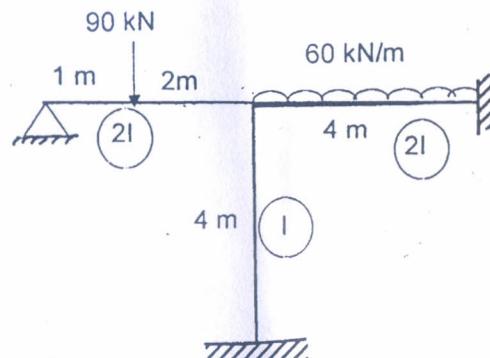
- (d) Analyse the rigid jointed plane frame shown below.



3. (a) Analyze the two-span continuous beam shown below using moment distribution method to obtain the support moments.

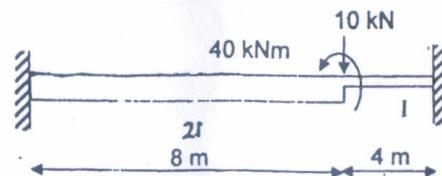


- (b) Analyze the rigid jointed frame shown below using slope-deflection method.



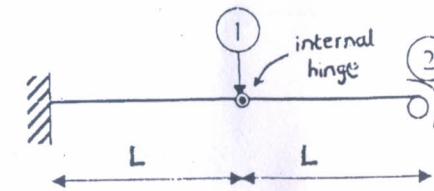
Or

- (c) Find the support moments in the non-prismatic beam shown below by moment distribution method.

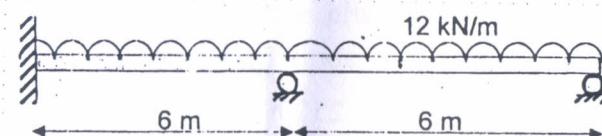


- (d) Solve the above problem (Q3c) using slope deflection method.

4. (a) Derive the stiffness matrix for the beam shown below.

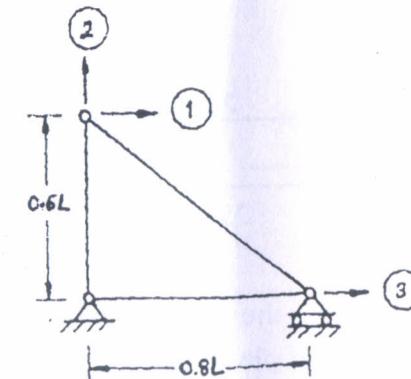


- (b) Determine the rotations at supports B and C of the continuous beam shown below.

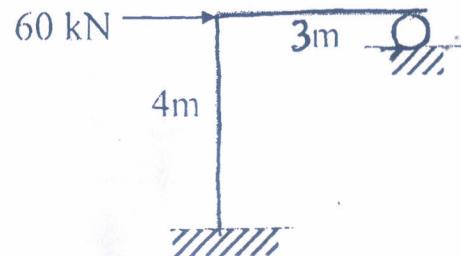


Or

- (c) Obtain the stiffness matrix for the following truss structure.

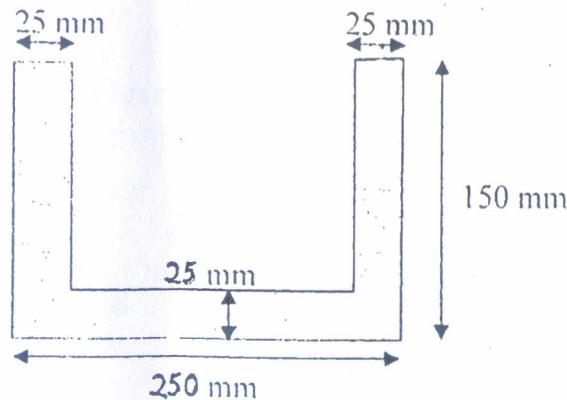


- (d) Analyse the rigid-jointed frame shown below using stiffness matrix method.



5. (a) List all the assumptions in plastic theory of structures.
 (b) For beam section shown below, determine the plastic modulus and the (full) plastic moment about horizontal axis.

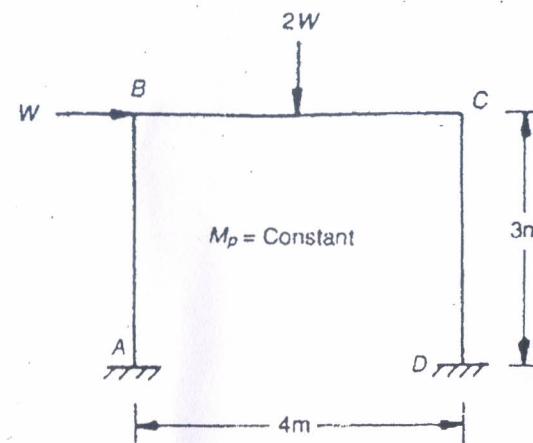
Take $f_y = 250 \text{ N/mm}^2$.



Or

- (c) Describe the steps involved in any *one* method of plastic analysis of structures.

- (d) Determine the load factor for the portal frame shown below :



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TCE-504

B. Tech. (Civil Engg.) (Fifth Semester) End Semester Back EXAMINATION, 2016

WATER RESOURCES ENGG—I

Time : Three Hours] [Maximum Marks : 100

- Note : (i) This question paper contains five questions with alternative choice.
(ii) All questions are compulsory.
(iii) Each question carries four Parts (a), (b), (c) and (d). Attempt either Parts (a) and (b) or (c) and (d) of each question.
(iv) Each Part carries ten marks. Total marks assigned to each question are twenty.

1. (a) Draw a neat sketch of an automatic rain gauge (Float type) and describe its working.
(b) The following data was obtained from a rain gauge installed in a catchment of area 25 km^2 :

Time from start (hr)	Accumulated rainfall (mm)
0	0
1	6

2	17
3	57
4	70
5	81
6	87
7	90

If the volume of runoff due to the storm is 1.2 mm^3 , estimate the ϕ -index of the catchment.

Or

- (c) Discuss the various types and forms of precipitation.
- (d) The following are the rain gauge observations during a storm :

Time since commencement of storm (min)	Accumulated rainfall (cms.)
5	0.1
10	0.2
15	0.8
20	1.5
25	1.8
30	2.0
35	2.5
40	2.7
45	2.9
50	3.1

From the above data, prepare maximum intensity-duration curve.

2. (a) What is unit hydrograph ? State the various assumptions on which UH theory of is based. Explain the use for unit hydrograph.
- (b) According to Gumbel's the estimate flood peaks for a river, based on year of data, for two return periods are :

Return period (years)	Peak flood (m^3/s)
100	485
50	445

Estimate the magnitude of peak flood in river with a return period 1000 years.

Or

- (c) Draw a typical single peaked flood hydrograph and described the various parts of it.
- (d) A basin is divided by 1-hr isochrones in to four sub areas of size 2.0, 2.5, 3.5 and 1.7 km^2 from the upstream end of the outlet respectively. A rainfall event of 5-hr duration with intensities of 1.7 cm/hr for the first 2 hr and 1.25 cm/hr for the next 3 hr occurs uniformly over the basin. Assuming a constant runoff coefficient 0.5, estimate the peak rate of runoff.

3. (a) What are the factors affecting the duty of water ?
- (b) A 300-mm well fully penetrates a confined aquifer of thickness 15 m, was pumped at a constant rate of 30 liters per sec. At the equilibrium stage, the following drawdown values at two observation wells A and B were noted.

Observation well	Radial distance from pumping well (m)	Drawdown (m)
A	10	1.50
B	40	1.0

Calculate radius of influence, drawdown at the pumping well, permeability and transmissibility of the aquifer.

Or

- (c) Derive the Dupuit's formula for a discharge of a well in unconfined aquifer assuming equilibrium flow conditions. State all assumptions made.
- (d) Water requirements of crops during Kharif, Rabi and hot weather seasons in an irrigation scheme are 15, 16 and 10 cumecs respectively. The other data is under :

Canal transit losses = 15%

Capacity factor = 0.8
Time factor = 0.7
Tank losses = 20%
Assume base period for above season is 120 days.

Estimate :

- (a) Design discharge of the canal
(b) The gross storage capacity of the reservoir

4. (a) Discuss with neat sketch, the various storage zones of the dam reservoir.
(b) Find the probable life of a reservoir with an initial capacity of 3700 hact-m and the average annual inflow 7400 hact-m with average annual sediment inflow 2×10^6 kN. Assume specific weight of silt as 11.2 kN/m³. The useful life of the reservoir will terminate when 80% of its initial capacity is filled with sediment. The value of trap efficiencies is as :

Capacity inflow ratio	Trap efficiency %
0.1	87
0.2	93
0.3	95
0.4	95.5
0.5	96

0.6	96.5
0.7	97
0.8	97.3
0.9	97.4
1.0	97.5

Or

- (c) Classify the different irrigation methods and types of irrigation.
- (d) The following data indicate the monthly flow rate of river at a particular site :

Month	Avg. Discharge in cumecs
Jan.	115
Feb.	90
Mar.	75
April	45
May	35
June	20
July	60
Aug.	100
Sept.	160
Oct.	140
Nov.	120
Dec.	100

Estimate the minimum storage required to supply the water continuously at a rate of 80 cumecs.

5. (a) What are the different types of cross drainage works ? State the conditions under which each one is adopted. Sketch any *one* of them.
- (b) Design a channel in allowed soil for the following data by Kennedy methods taking values of the coefficient and exponents in Kennedy formula as 0.55 and 0.64 full supply discharge = $55 \text{ m}^3/\text{sec}$

$$b/y = 11$$

$$\text{side slope} = 0.5 \text{ H : 1V}$$

$$\text{CVR (m)} = 1.0$$

$$\text{Chezy's } c = 50$$

Or

- (c) Write a detailed note on comparison of Kennedy's and Lacey's silt theories, and further improvement over Lacey's theory.
- (d) Design a trapezoidal shaped concrete lined channel to carry a discharge of 105 cumecs at a slope of 25 cm/km. The side slope of channel are 1.5 : 1.0, the value of n may be taken as 0.016. Assume the limiting velocity as 1.5 m/sec.