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Roll No.

B.Tech. III Sem.

TU-356

B.Tech. Examination, Dec. 2014

EC, EI, ME Branches

Industrial Psychology

[BT-324(N)]

Time : Two Hours]

[Maximum Marks : 50]

Note : Attempt any **five** questions. **All** questions
carry equal marks.

1. What are the objectives of industrial psychology? Explain the historical foundation of industrial psychology. 10
2. Why psychologists examine Individual differences? How knowing individual differences helps in predicting behaviour? 10

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3. Describe the different types of intelligence tests useful in assessing human mental abilities. 10
 4. "Personality inventories measure more deeper aspects of personality than rating scales." Justify the statement. 10
 5. What is meant by organisational culture? How can healthy organisational culture improve the performance of employees? 10
 6. Explain a good leadership. How can it raise the group morale of Industrial employees. 10
 7. Why do Industrial engineering strongly emphasises understanding of workers and their needs in order to raise and improve production? Elaborate. 10

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8. What are the negative effects of stress on workers? How can a psychologist play the role in maintaining individual well being. 10
 9. What are the necessary steps in selection procedure? Describe the major techniques used for employee selection. 10
 10. Why employee counselling service is needed in Industry? What is the role of a counsellor in Industry? 10

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Roll No.

B.Tech.-III Sem.

TU-368

B. Tech. Examination, Dec. 2014

M.E. Branch

Fluid Mechanics

BT-310(N)

Time : Three Hours]

[Maximum Marks : 100

Note : Attempt any **five** questions. **All** question carry equal marks.

1. (a) A skater weighing 750N skates at 15m/s and is supported by an average skating area of 10cm^2 . Determine the average thickness of thin film of water that exists between the skates & the ice. Take the viscosity of water as 0.01 poise & the effective coefficient of friction μ between skates & ice as 0.02. 10
- (b) In a 50mm long journal-bearing arrangement, the clearance between the two at concentric condition is 0.1mm.

P.T.O.

The shaft is 20mm in dia & rotates at 3000rpm. The dynamic viscosity of the lubricant used is 0.01 Pas. and the velocity variation in the Lubricant is linear considering the Lubricant to be Newtonian, calculate the frictional torque the Journal has to overcome, and the corresponding power loss. 10

2. (a) Define cohesion, Adhesion & Surface tension in detail? 10

- (b) State & Proof Pascal's law? 10

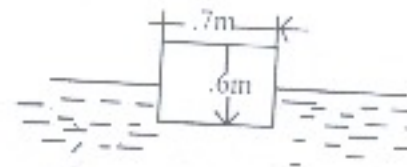
3. (a) What is the flow field associated with the following velocity potential function?

$$\psi = 3x^2 - 3x + 3y^2 + 16z^2 + 12zt$$

Does it satisfy the continuity equation for incompressible fluid. Determine the acceleration vector? 10

- (b) An empty tank closed from all sides measure $12.5\text{m} \times 7\text{m} \times 6\text{m}$. Its weight is 12100N. If it floats on water as shown below, prove that the equilibrium stable. 10

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4. (a) In a two-dimensional incompressible flow, the fluid velocity components are given by $u = x - 4$ & $v = -y - 4x$

Show the velocity potential exists & determine its form. Find also the stream function. 10

- (b) A fluid flow Field is given by $v = x^2yi + y^2zj - (2xyz + yz^2)k$

Prove that it is case of possible steady incompressible fluid flow. Calculate the velocity & acceleration at the point (2,1,3). 10

5. (a) Derive an Expression for rate of flow through venturimeter? 10

- (b) What is the function of Pilot tube? A nozzle of diameter 20mm is fitted to a pipe of diameter 40mm. Find the force exerted by the nozzle on the water

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P.T.O.

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which is flowing through the pipe at the rate of $12\text{m}^3/\text{min}$. 10

6. (a) Define all the Hydraulic co-efficient study in fluid mechanics? The Read of of water over an orifice of diameter 40mm is 10m. Find the actual discharge and actual velocity of the Tet at Vena-contracta. Take $c_a = .6$ & $c_v = .98$? 10
- (b) Why we study orifice & notches? Derive an expression for discharge through in large Rectangular orifice? 10
7. (a) Derive an expression for viscous flow velocity distribution equation along a cylindrical pipe? 10
- (b) What are the different step used in Buckingham's A-theorem for Relate a relation b/w depended & independent variable? 10
8. (a) Why There is a need of Model before manufacturing actual machine? A 1 : 64 model is constructed of an open channel in concrete which has Manning's

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- (45)
- $N = .014$. Find the N for the model? 10
- (b) What is Distorted Models? Derive all Scale Ratio of Distorted Models? 10
9. (a) Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by

$$\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2 \quad 10$$

- (b) Find the centre of pressure for inclined plane surface submerged in liquid? 10
10. (a) A 150 mm diameter pipe reduces abruptly to 100 mm dia. If the pipe carries water at 30 litre per second, calculate the pressure loss across the contraction. Take the coefficient of contraction as 0.6? 10

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- (b) A differential manometer is connected at the two points A & B of two pipes as shown below. The pipe A contain a liquid of s_p , gravity=1.5 while pipe B contain a liquid of s_p , gravity=.9. The pressure at A & B are 1 Kgf/cm^2 and 1.80 kgf/cm^2 respectively. Find the diff. in mercury level in the differential manometer?

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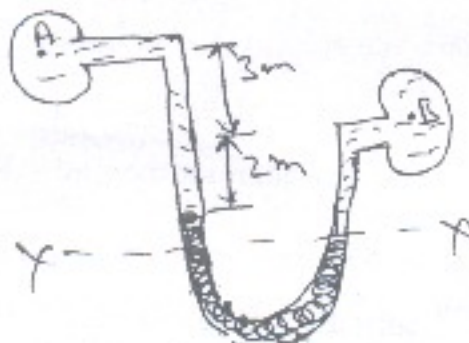


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Roll No.

B.Tech. III Sem.

TU-369

B.Tech. Examination, Dec. 2014

ME Branch

Material Science

BT-311(N)

Time : Three Hours]

[Maximum Marks : 100

Note: Attempt any **five** questions.1. Attempt any **two** parts of the following: $10 \times 2 = 20$

- (a) What do you understand by 'material science and Engineering materials? Demarcate between them with illustrations.
- (b) What are Bravais Lattices and why are they limited to 14 in number.
- (c) State & explain Bohr's model of an electron in atom.

P.T.O.

2. Attempt any **two** parts of the following:

- (a) What are Miller Indices? How are they determined?
- (b) Explain how dislocation move during plastic deformation and during creep.
- (c) Draw the (1,1,7) plane on a BCT (body centered tetragonal) unit cell. Also show its interaction with (1,1,0) plane.

3. Attempt any **two** of the following: $10 \times 2 = 20$

- (a) How are mechanical properties important to a design engineer and a material Scientist?
- (b) Explain how impact testing of a material is carried out. What information is obtained by impact testing?
- (c) Name some specific engineering application where various hardness tests are essential.

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4. Attempt any **two** of the following: $10 \times 2 = 20$

- (a) Explain Gibbs phase rule. How is it used.
- (b) Explain the phenomenon of creep. Name some alloys that are creep resistant.
- (c) Draw iron-carbon equilibrium diagram and show all the salient features on it.

5. Attempt any **two** of the following: $10 \times 2 = 20$

- (a) What are different types of cast irons? How do they differ from each other?
- (b) Write the composition, properties and uses of different types of brasses and bronzes.
- (c) Name any five ferrous alloys and write their composition, properties and applications.

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P.T.O.

6. Why is heat treatment important to steel? Name different heat treatment processes and explain their objectives. 20
7. What is super conductor and explain its importance and application. Also differentiate between Type I and Type II super conductors. 20
8. Explain, how n-type and p-type semiconductor are made. Describe how p-n Junction and transistors work and what are their applications? 20
9. Write short notes on any **two** of the following: $10 \times 2 = 20$
- (i) Composite materials and its uses
 - (ii) Nano materials and its uses
 - (iii) Various types of polymers
10. Explain ceramic materials, their characteristics, basic structure and applications.

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Roll No.

B.Tech.-III Sem.

TU-76

B. Tech. Examination, Dec. 2014

Mechanical Engg.

Fluid Mechanics

(BT-312)

Time : Three Hours]

[Maximum Marks : 100

Note : (i) Attempt any **five** questions.

(ii) Use of Calculator is permitted.

(iii) Any Data is missing.

1. (a) (i) Define atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure. 5

(ii) What are the conditions for a flow to be irrotational. 5

(b) A fluid element has a velocity

$$\vec{v} = -y^2 x \hat{i} - 2y x^2 \hat{j}$$

Show that the motion at

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$(x, y) = \left(\frac{1}{\sqrt{2}}, 1\right)$ is rotational and incompressible. 10

2. (a) (i) Differentiate between uniform and non uniform flow. 5
 (ii) Explain Physical properties of fluids. 5
 (b) Prove that the intensity of hydrostatic pressure at any point in a liquid is proportional to the depth of the liquid over the point. 10
3. (a) Explain the principle of fluid statics with the help of Manometer used for measuring pressure difference. 10
 (b) Define the terms : 10
 (i) Vortex flow
 (ii) Forced vortex flow
 (iii) Free Vortex flow
4. (a) State Bernoulli's theorem. Outline the assumptions made in deriving Bernoulli's equation. Derive Bernoulli's equation. 10
 (b) What is function of a venturimeter. Prove that formula for discharge through a venturimeter. 10

5. (a) Assuming that the drag force exerted by a flowing fluid on a body is a function of the density, viscosity and velocity of the fluid and characteristics length of the body, develop a general equation using Buckingham π theorem. 10
 (b) State and prove Buckingham's π -theorem. 10
6. (a) Define and give significance of following dimensionless numbers. Develop Mathematical Expression for these : 10
 (i) Reynolds number
 (ii) Mach's number
 (iii) Euler's number
 (b) A fluid having a viscosity of 0.04 kg/ms and sp. gravity of 1.83 is to be pumped at a rate of 0.045 m³/sec. From a supply tank through a frictionless 18m long pipe having a diameter of 150mm into a storage tank. If the overall pump and motor efficiency is 50%, specify a suitable electric motor for the required job. Neglect entrance and exit losses.

(10)

For laminar flow $f = 16/Re$

For turbulent flow $f = 0.079/Re^{0.25}$ 10

7. (a) Give a list of various types of pipe fittings. How is friction loss due to there fitting accounted for? Explain. 10
- (b) Classify pumps with the help of sketch, explain the working of a centrifugal pump. 10
8. (a) Obtain an expression for the thickness of the boundary layer for laminar flow assuming the velocity distribution law is

$$\frac{u}{U} = 2\left(\frac{Y}{\delta}\right) - \left(\frac{Y}{\delta}\right)^2$$

where U = approach velocity of the stream. 10

u = velocity of the stream in the boundary layers. at a distance Y from the boundary.

δ = thickness of the boundary layer.

- (b) Explain briefly the boundary layer theory.

10

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B.Tech. III Sem.

TU-370

B.Tech. Examination, Dec. 2014

ME Branch

Mechanics of Solids

BT-312(N)

Time : Three Hours]

[Maximum Marks : 100

Note: All the questions are **compulsory**. Attempt any **four** of the following: $5 \times 4 = 20$

1. (a) Prove that the relation that

$$m = EI \frac{d^2y}{dx^2} \text{ where } E = \text{young mode}$$

$I = \text{moment of Inertia.}$

(b) Write short notes on the following:

- (i) Principal planes
- (ii) Principal stresses
- (iii) Ductility and Toughness

P.T.O.

- (c) Derive the relation for the elastic constant for an Isotropic

$$E = \frac{9 GK}{3K + G} \quad \text{where}$$

K=Bulk mode

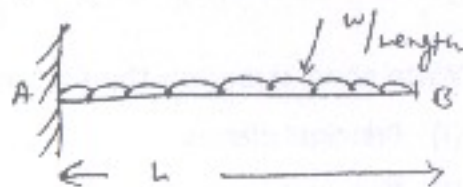
G= modulus of Rigidity

E=mode of Elasticity

- (d) Draw Mohr's circle for two mutually perpendicular diagram with neat sketch.
- (e) What is the maximum shear stress theory.
2. Attempt any **two** of the following:

$$10 \times 2 = 20$$

- (a) Explain the Macaulay's method for when a simply supported beams with HDL in KN/m length?
- (b) Explain with neat sketch diagram.



Derive formula for slope and deflection of cantilever beam According moment

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area method.

- (c) Determine equivalent bending moment for the shaft subjected to combined Bending & torsion?
3. Attempt any **two** of the following: $10 \times 2 = 20$
- (a) Write the assumption of Euler's Theory of Buckling of columns.
- (b) A hollow cast Irons column whose outside diameters is 200mm has a Thickness of 20 mm. at is 4.5 Long and is fixed at Bath end, calculate the safe load of Rankin-Gordon formula using a factor of safety of 4.
- (c) Determine the maximum Compressive stress set up in a 200 mm x 60 mm I-section girder carrying load 100 KN with an Centricity of 6mm from the critical axis of the section. The ends of the structure are pin-Jointed and overall length is 4 m.
4. Attempt any **two** of the following: $10 \times 2 = 20$
- (a) Derive the equation for lami's theorem for thick cylinder.
- (b) A steel cylinder pipe is 2 m in diameter, with plate 11 mm thick, the efficiency

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P.T.O.

of the longitudinal and Circumferential Joint are 80% and 45% respectively, of the tensile stress in the plating is to be limited to 120 MN/m^2 . Find the safe pressure in the cylinder.

- (c) Derive the express 10 n for hoop and Longitudinal stresses in a thin cylinder closed at bath ends, end subjected to internal fluid pressure state the assumption.
- 5. Attempt any **two** of the following: $10 \times 2 = 10$
 - (a) Derive equation for unsymmetrical Bending.
 - (b) Derive the equation for centeroidal principal axis of Beam.
 - (c) A Beam of rectangular section 80 mm wide and 120 mm deep is subjected to a bending moment of 12 KN-m, the trace of the plane of loading Inclined 450 to the y-y axis of the section, Locate the Neutral axis of the section and calculate the maximum bending stress Inuced in the section.

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B.Tech.-III Sem.

TU-371**B. Tech. Examination, Dec. 2014****M E Branch****Thermodynamics****BT-313(N)***Time : Two Hours]**[Maximum Marks : 50*

Note : Attempt any **five** questions. **All** questions carry equal marks.

1. Define the terms 'system', 'Boundary' Surrounding and 'universe'. Also discuss about closed and open systems giving examples of each. 10
2. What is meant by thermodynamic equilibrium? What is Zeroth law of thermodynamics? 10

P.T.O.

3. State the first Law of thermodynamics and prove that for non flow process, it leads to

$$Q = W + \Delta V$$

10

4. A steam turbine receives a steam flow of 4500 Kg/hr and delivers 4800 kw. The heat loss from the turbine is negligible. Find the change in enthalpy across the turbine if the velocity of steam at entrance is 60m/sec. and at exit is 360m/sec. The inlet pipe is 4m above the exhaust.

10

5. Why Carnot cycle is a theoretical cycle? Explain three reversible engines of Carnot type are operating in series between the limiting temperatures of 1100K and 300K. If work output from engines is in proportion of 3 : 2 : 1, Determine the intermediate temperature.

10

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6. Describe the Gibbs function. How does it differ from the availability function?

10

7. What is dryness fraction? Explain the measurement of dryness fraction of steam by combined separating and throttling calorimeter.

10

8. What do you understand by I.C. Engine? Distinguish between spark Ignition engine and compression Ignition engines.

10

9. 3Kg of steam at 18 bar occupies a volume of 0.225 m³. The steam expands at constant volume to a pressure of 10bar. Determine the final dryness fraction. Find internal energy change in entropy and work done.

10

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P.T.O.

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10. Explain properties of steam. Also describe Rankine cycle with diagram. 10

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B.Tech. III Sem.

TU-77**B.Tech. Examination, Dec. 2014****Strength of Materials****(BT-313)***Time : Three Hours]**[Maximum Marks : 100*

Note: Attempt any **five** questions. All questions carry equal marks.

1. (a) A leaf spring 75 cm long is required to carry a central point load of 8 kN. If the central deflection is not to exceed 20 mm and the bending stress is not to be greater than 200 MPa, determine the thickness, width and number of plates. Also compute the radius to which the plates should be curved. Assuming width of the plate equal to 12 times its thickness and $E=200 \text{ G Pa}$. 10

P.T.O.

(b) What do you mean by spring. State its important function. What are materials preferred for springs. 10

2. (a) Define following with respect to column :
(i) Slenderness Ratio 10
(ii) Buckling Factor
(iii) Buckling load
(iv) Safe load

(b) Derive Euler's buckling load for a column when one end fixed and other end hinged. 10

3. (a) What is meant by pure bending? Sketch any loading of a beam that would lead to pure bending. A cast iron T- beam has the following dimensions: 10

(b) Overall depth = 160 mm
Width of flange = 150 mm
Flange thickness = 40 mm
Web thickness = 50 mm
The beam is simply supported over a span of 2.5 meters placed in the in-

verted T- position (i.e. flange at bottom). If the maximum allowable tensile stress in the flange and compressive Stress in the web are limited to 20 N/mm^2 and 75 N/mm^2 respectively, find the maximum central load that the beam can safely carry. 10

4. (a) Find the value of slope and deflection at any point in a beam (cantilever) with a concentrated load 'W' at free end. 10

(b) A cantilever beam 12 cm wide and 20 cm deep is 2.5 m long. What uniformly distributed load should the beam carry to produce a deflection of 0.5 at the free end and what concentrated load at free end and what concentrated load at free end would produce the same deflection? Give the slope at the free end in both cases. Ignore self weight of the beam Take $E = 2 \times 10^5 \text{ N/mm}^2$ 10

5. (a) Derive Torsion equation for circular shaft stating the assumption made. 15
- (b) What will be the required diameter of shaft to transmit 60 KW at 60 rpm if maximum torque is 30 percent greater than the mean and the limit of torsional stress is to be 56 MPa? 5
6. (a) Prove that a hollow shaft is always stronger than a solid shaft of the same material, weight and length, when subjected to simple torque. 10
- (b) Find the maximum stress in a propeller shaft of 40 cm external diameter and 20 cm internal diameter, when subjected to a twisting moment of 4650 N-m. If the modulus of rigidity is $G=82$ GPa how much is the twist in a length 20 times the external diameter?

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7. At a point in material under stress, the intensity of the resultant stress on a certain plane is 60 N/mm^2 (tensile) inclined 30° to normal of that plane. The stress on a plane right angles to this has a normal tensile component of intensity 40 N/mm^2 . Find (i) The resultant stress on the second plane (ii) the principal planes and stress (iii) The plane of maximum stress and its intensity. Also verify your answer by graphical method. 20
8. (a) Write down the Rankine's Formula and justify how it is valid for long as well as intermediate column. 10
- (b) A hollow cast iron column with fixed ends supported an axial load of 1000 K.W. If the column is 5 m long and has an external diameter of 250 mm, find the thickness of metal required. Use the Rankine's formula, taking a constant $1/6400$ and assume a working stress of 80 N/mm^2 . 10

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P.T.O.

9. Write short notes on :

- (a) Laminated spring
- (b) Theories of failure
- (c) Compound cylinder
- (d) Curved beam
- (e) Stress in crane hook
- (f) Volumetric stress

10. Prove that the thickness of the cylinder is determined by $t = \frac{pD}{2\sigma_t}$

A cylindrical shell 90 cm long and 20 cm in internal diameter having thickness of metal as 8 mm, is filled with fluid at atmospheric pressure. If an additional 20 cm³ of fluid is pumped into the cylinder, find (i) the pressure exerted by the fluid on the cylinder and (ii) the hoop stress induced.

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B.Tech.-III Sem.

TU-364**B. Tech. Examination, Dec. 2014****ME, EC Branches****Digital Logic Design****BT-306(N)***Time : Three Hours /**[Maximum Marks : 100***Note :** (1) Attempt any **five** questions.(2) **All** questions carry equal marks.

1. (a) Represent the decimal number 5137 in

(i) BCD

(ii) Excess-3 Code

(iii) 2421 Code

(iv) a 6311 code.

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(b) (i) The hamming code 010110110 is received at the receiving end. Correct the received data if there is any error. There are four parity bits and even parity is used.

8

P.T.O.

- (ii) Express the Boolean function $f(A,B,C) = A+B'C$ as a sum of min-terms. 4

2. (a) Design a NAND logic diagram that implements the complement of the following function 8

$$F(A,B,C,D) = \sum m(0,1,2,3,4,8,9,10,11,12)$$

- (b) Minimize the following Boolean function. Using tabular method (Quine Mc-Closky Method) 12

$$F(A,B,C,D,E) = \sum m(0,2,4,10,15,19,23,29,31)$$

3. (a) Design an excess-3 to BCD Code converter. 7

- (b) (i) Design a decimal adder. 7

- (ii) What is Binary Multiplier? Explain the procedure of binary multiplier. 6

4. (a) What is the difference between decoder and encoder? Design a four input priority encoder with inputs as given table. Here D0 has the highest priority and D3 the lowest priority. 10

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Input				Output		
D ₀	D ₁	D ₂	D ₃	X	Y	V
0	0	0	0	X	X	0
1	0	0	0	0	0	1
X	1	0	0	0	1	1
X	X	1	0	1	0	1
X	X	X	1	1	1	1

- (b) Implement the function :

$$F(A,B,C) = A'B'C + A'BC' + AB'C' + ABC$$

by using 8:1 and 4:1 multiplexers. 10

5. (a) What is memory? Write down the classification of memories. Draw and explain static RAM cell. 10

- (b) Implement the following functions using 3-input, 3 product terms and 2 output PLA : 10

$$F_1 = AB' + AC$$

$$F_2 = AC + BC$$

6. (a) What is PAL? Describe the PAL with the help of suitable example. 10

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(b) Differentiate between the following :
10

- (i) EPROM and EEPROM
- (ii) Static RAM and dynamic RAM
- (iii) PAL and PAL
- (iv) Combinational circuit and sequential circuit.

7. (a) Write down the characteristic table, characteristic equation, Excitation table and graphic symbol for the following flip-flop:

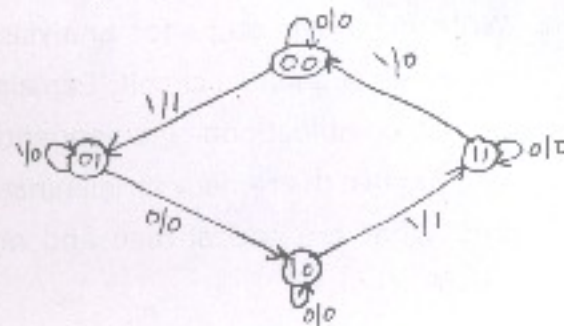
- (i) SR flip-flop 15
- (ii) JK flip-flop
- (iii) T flip-flop
- (iv) D flip-flop

(b) Explain the working of Master Slave JK-flip-flop. 5

8. (a) Design a clocked sequential circuit that

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operates according to the state diagram shown. Implement the circuit using T-flip-flop. 10



(b) What is shift Register? Design a 4 bit Ripple counter using D flip-flop. 10

9. Draw and explain the block diagram of Asynchronous sequential circuit. An asynchronous sequential circuit has two internal states and one output. The two excitation functions and one output function describing the circuit are, respectively 20

$$Y_1 = x_1x_2 + x_1y_2 + x_2y_1$$

$$Y_2 = x_2 + x_1y_1 + y_2 + x_1y_1$$

$$Z = x_2 + y_1$$

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P.T.O.

- (i) Draw the logic diagram of the circuit.
 - (ii) Derive the transition table and output map.
 - (iii) Obtain a flow table for the circuit.
10. Write down the steps for analysis of asynchronous sequential circuit. Explain the hazards in combinational and sequential circuit. Also Explain the remedy for eliminating a hazard. What are critical race and non critical race?

20