

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering
B. Sc. Engineering 2nd Year 1st Term Examination, 2017

EE 2105
(Electronics)

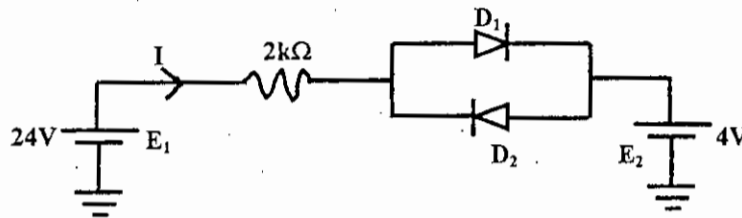
Time: 3 Hours

Total Marks: 210

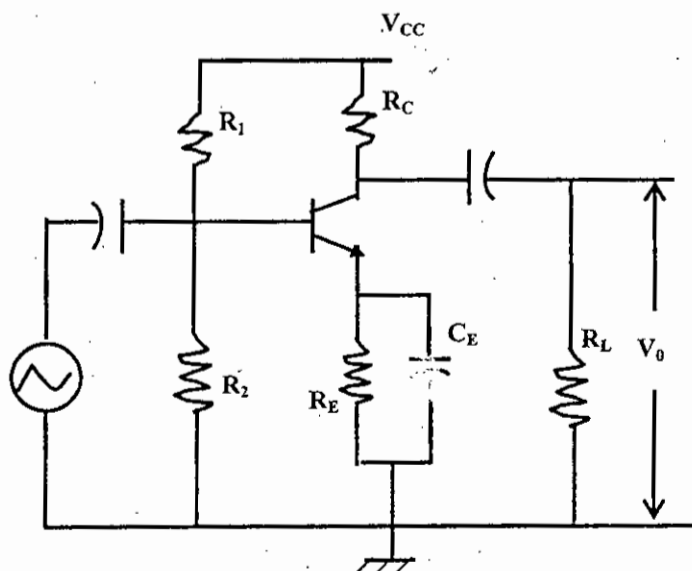
- N.B.:** i) Answer any THREE questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.
iii) Assume reasonable data if any missing.

SECTION-A

- 1(a) Describe different modelings of pn diode. 15
- 1(b) What is meant by rectification? Describe a full-wave bridge rectifier circuit with necessary diagrams. 12
- 1(c) Determine the current I in the circuit shown in figure below. Assume the diodes to be of silicon and forward resistance of diodes to be zero. 08



- 2(a) Explain the principle of operation of a π -filter. 10
- 2(b) What is Zener break down? How this properties can be used to regulate voltage – Explain. 12
- 2(c) Why BJT is named so? BJT is a switch – Explain. 13
- 3(a) What are α , β and γ in the study of BJT? What are I_{CEO} and I_{CBO} ? 12
- 3(b) What is meant by stability factor? Deduce its general expression and hence show that the stability factor of the following amplifier is unity. 13

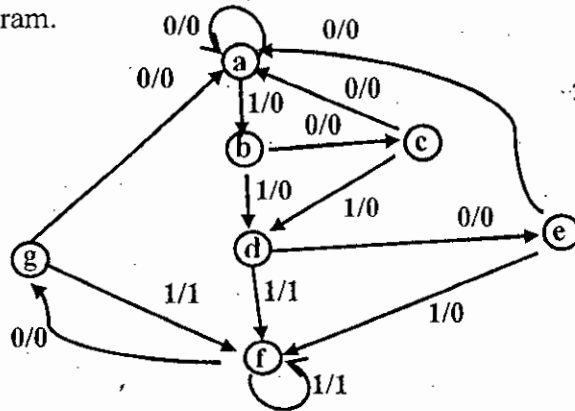


- 3(c) Mention minimum 10 differences between BJT and FET. 10
- 4(a) What is OP-AMP? How OP-AMP can be used as an integrator? 06
- 4(b) What are meant by Diac, Triac and SCR? 09

- 4(c) How can you draw the transfer characteristics of JFET? Explain. 08
- 4(d) Mention minimum five differences between D-MOS and E-MOS. 05
- 4(e) Describe the channel formation mechanism of a P-channel E-MOS. 07

SECTION-B

- 5(a) Mention the differences between analogue and digital electronics. 05
- 5(b) What is meant by complement? Perform the following subtractions using 2's complement.
(i) 11010 - 1101 and (ii) 100 - 110000. 08
- 5(c) Define self-complementary code. Represent the decimal number 8260
(i) in BCD, (ii) in excess-3 code and (iii) in 2, 4, 2, 1 code. 11
- 5(d) Simplify the following Boolean function and implement it with NAND gate:
 $F = AC' + ACE + ACE' + A'CD' + A'D'E'$ 11
- 6(a) Write the truth table of full adder and subtractor. 08
- 6(b) Simplify the following function by using the tabulation method:
 $F = \sum(0, 1, 2, 8, 10, 11, 14, 15)$. 14
- 6(c) Design a BCD to excess-3 code converter with logic gates. Make necessary simplifications. 13
- 7(a) Mention the differences between microcontroller and microprocessor. 07
- 7(b) Reduce the number of states in the following state diagram and draw the reduced state diagram. 15



- 7(c) Define register and counter. Design a counter with the following binary sequence: 0,1,3,7,6,4 and repeat. Use T flip-flops. 13
- 8(a) Give a short brief on different types of resistance welding. 15
- 8(b) What are transducers? Mention minimum five categories transducers for different applications. 08
- 8(c) What is a regulated power supply? Design a +15V regulated DC power supply and show the wave shapes at different points. 12

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ME 2113
(Fluid Mechanics I)

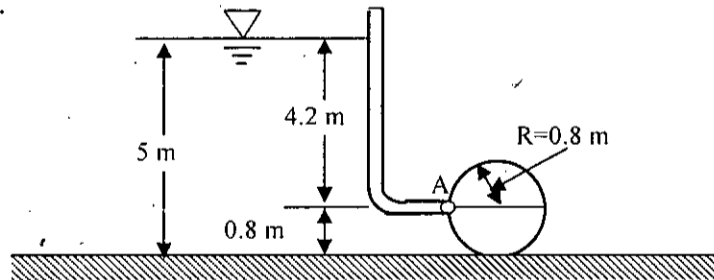
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SECTION-A

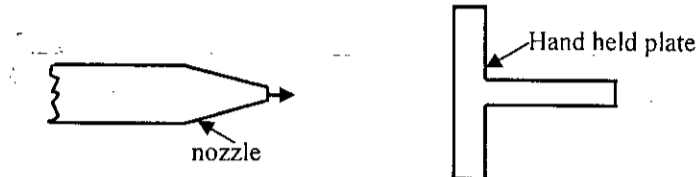
- 1(a) What is mean by 'fluid' and 'fluid particle'? Why do we need to assume fluid as a continuous smooth medium in classical fluid mechanics? 12
- 1(b) What is surface tension? Why a droplet of water that keeps growing by the addition of more mass of water will break down? Explain. 08
- 1(c) A rectangular plate of size 30 cm by 50 cm and weighing 26 N slides down a 32° inclined surface at a uniform velocity of 2.2 m/sec. If the uniform 2 mm gap between the plate and the inclined surface is filled with oil, determine the viscosity of the oil. 15
- 2(a) Based on the pressure gradient equation for static fluid, explain how pressure varies from point to point in an incompressible fluid? 08
- 2(b) What is manometer sensitivity and how the sensitivity of manometer can be increased? 06
- 2(c) Explain with appropriate diagrams, why the center of pressure lies below the centroid of vertical plane submerged surface? 06
- 2(d) A long solid cylinder of radius 0.8 m hinged at point A is used as an automatic gate. When the water level reaches 5 m, the gate opens by turning about the hinge at point A. Determine the hydrostatic force acting on the cylinder. Assume unit length for the cylinder. 15



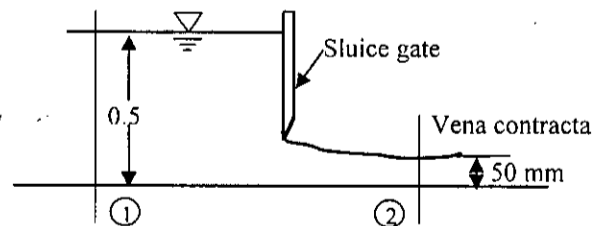
- 3(a) What is meant by buoyancy? Deduce the expression for center of buoyancy with necessary sketches. 10
- 3(b) Using analytical method, derive the expression for metacentric height of a floating body. 10
- 3(c) A solid cylinder of diameter 4.0 m has a height of 6.2 m. Find the metacentric height of the cylinder, if the specific gravity of the material of cylinder is 0.65 and it is floating in water with its axis vertical. State whether the equilibrium is stable or unstable. 15
- 4(a) When a liquid container subjected to constant horizontal acceleration, derive the expression of variation of pressure on the rear and front of the liquid container. 17
- 4(b) When an open rectangular tank 1.6 m wide, 3 m long and 2.5 m deep containing 1.2 m of water is accelerated horizontally parallel to its length at the rate of 4.5 m/sec^2 , how much water will spill away? 18

SECTION-B

- 5(a) Differentiate between the integral and differential approaches of fluid flow problem analysis method with examples. 10
- 5(b) Explain the methods of visualization of fluid flow with appropriate diagrams. Deduce the equation of streamline. 13
- 5(c) Water from a stationary nozzle strikes a flat plate as shown. The water leaves the nozzle at 15 m/sec; the nozzle area is 0.01 m^2 . Assuming the water is directed normal to the plate and flows along the plate, determine the horizontal force needed by a person to hold it in place. Adopt integral approach to solve the problem. 12



- 6(a) What the following dimensionless numbers represent for a flow – 15
 (i) Reynolds number (ii) Mach number
 (iii) Froude number (iv) Euler number
- 6(b) Distinguish between geometric similarity and dynamic similarity. 08
- 6(c) The flow over a rectangular notch depends upon velocity v , the length of the notch L , height of water above crest H , acceleration due to gravity g , fluid density ρ , flow rate over the notch Q and coefficient of discharge C_d . Determine the dimensionless groups. 12
- 7(a) Explain how the Bernoulli equation can be represented as a summation of different pressures along a streamline? 10
- 7(b) Derive the differential form of continuity equation. 12
- 7(c) Water flows under a sluice gate on a horizontal bed at the inlet to a flume. Upstream from the gate, the water depth is 0.5 m and the speed negligible. At the vena contracta downstream from the gate, the flow streamlines are straight and the depth is 50 mm. Determine the flow speed downstream from the gate and the discharge per unit width of the gate. 13



- 8(a) Deduce the equation to determine the flow velocity using pitot static tube with appropriate diagrams. 07
- 8(b) Derive the expression for time required to empty a tank, if an orifice exists at the bottom of the tank. 13
- 8(c) Find the depth and top width of a V-notch capable of discharging a maximum of $0.7 \text{ m}^3/\text{sec}$ such that the head shall be 75 mm for a discharge of 5.8 lit/sec. Its C_d is the same as that of a similar right angled V-notch for which $Q = 1.40H^{5/2}$. 15