

Registration No :

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Total Number of Pages : 02

B.Tech/
Integrated Dual Degree (B.Tech and M.Tech)
RBL2B002

2nd Semester Reg. / Back Examination: 2022-2023

Basic Electronics Engineering

AERO, AE, AUTO, BIOTECH, CHEM, CIVIL, CST, CSEAI, CEDES, CSE, CSIT, CSEAIME, ELECTRICAL & C.E, EEE, ELECTRICAL, ECE, ETC, EIE, MANUTECH, MECH, MME, METTA, MINERAL, MINING, PLASTIC, IT

Time : 3 Hour

Max Marks : 100

Q.Code : M383

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1

Answer the following questions:

- a) Draw the equivalent circuit diagram of a diode.
- b) Draw V-I characteristics of the ideal zener diode.
- c) Write the applications of CE, CB, CC configuration of transistors.
- d) Define slew rate.
- e) Distinguish between BJT and FET.
- f) Draw the circuit diagram of an Op Amp differentiator.
- g) Write 4 applications of closed loop Op amp circuits.
- h) Draw logic gate symbols for NOR & X-OR gates.
- i) Draw the OR gate using NAND gates.
- j) $(127)_{10} = (?)_3$ and $(110110)_2 = (?)_{16}$

Part-II

Q2

Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 × 8)

- a) Draw the VI characteristics of a diode and explain about its current equation.
- b) Explain the principle of operation of a pnp transistor.
- c) What is a zener diode? Explain about its constructional details with applications.
- d) Explain the operation of a digital inverter.
- e) Explain about MOSFET and its characteristics.
- f) Explain the principle of operation of a JFET.
- g) Design a circuit which produces the output voltage $V_0 = 2V_1 - 6V_2 + 9V_3$ using Op-amp with minimum resistance value 50kΩ.
- h) Write the ideal characteristics of Op-amp, with its physical interpretation.
- i) Derive the output voltage of a differentiator circuit using Op-amp.

- g) Find the moment of inertia of a rectangular section 60 mm wide and 40 mm deep about its centre of gravity.
- h) State and prove the theorem of parallel axis.
- i) State the principle of virtual work. Explain the application of the principle of virtual work in case of lifting machines.
- j) The equation of motion of a particle moving in a straight line is given by $s = 18t + 3t^2 - 2t^3$ where s is the total distance covered from the starting point in metres at the end of t seconds. Find:
- the time, when the particle reaches its maximum velocity
 - the maximum velocity of the particle.
- k) A particle is thrown with a velocity of 5 m/s at an elevation of 60° to the horizontal. Find the velocity of another particle thrown at an elevation of 45° which will have (a) equal horizontal range, and (b) equal maximum height.
- l) A body of mass 50 kg, moving with a velocity of 6 m/s, collides directly with a stationary body of mass 30 kg. If the two bodies become coupled so that they move on together after the impact, what is their common velocity.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3 Two smooth spheres of weight 'W' and radius 'r' each are in equilibrium in a horizontal channel of 'A' and 'B' vertical sides as shown in Fig. 4. Find the force exerted by each sphere on the other. Calculate these values, if $r = 250$ mm, $b = 900$ mm and $W = 100$ N. <https://www.bputonline.com> (16)

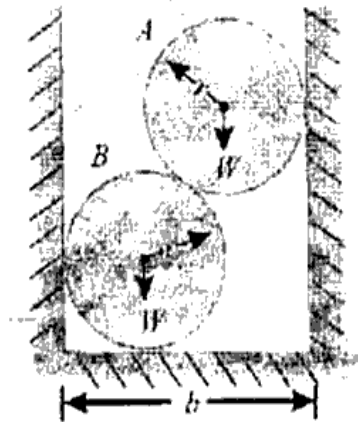


Fig. 4

- Q4 Find the reactions and forces in the members of the truss as shown in Fig. 5. (16)

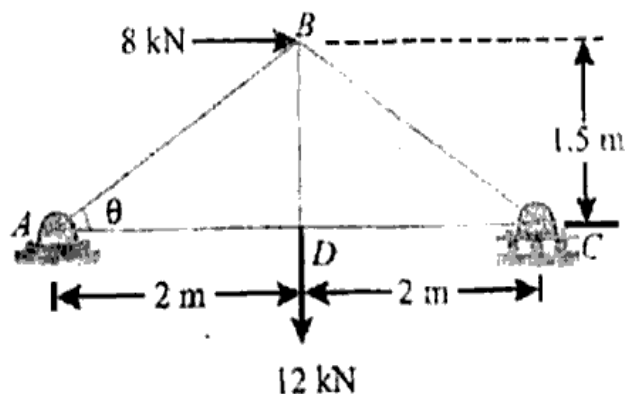


Fig. 5

- Q5** Two smooth inclined planes whose inclinations with the horizontal are 30° and 20° are placed back to back. Two bodies of mass 10 kg and 6 kg are placed on them and are connected by a light inextensible string passing over a smooth pulley as shown in Fig 6. Find the tension in the string. Take $g = 9.8 \text{ m/s}^2$. **(16)**

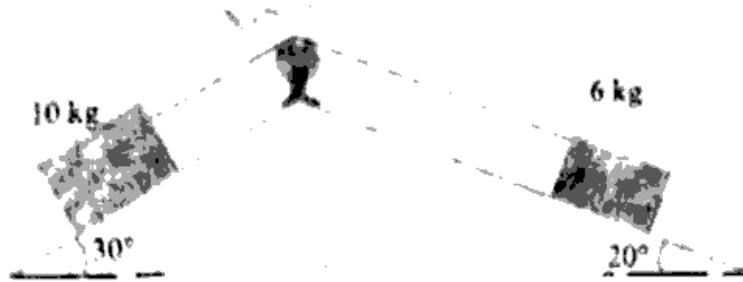


Fig. 6

- Q6** A body weighing 196.2 N slides up a 30° inclined plane under the action of an applied force 300 N acting parallel to the inclined plane. The co-efficient of friction, μ is equal to 0.2. The body moves from rest. **(16)**
- Determine:
- (i) acceleration of the body,
 - (ii) work done on the body in four seconds,
 - (iii) momentum of the body after four seconds,
 - (iv) impulse applied in four seconds.