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## Question Paper Code : 90871

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Sixth/Seventh Semester

Mechanical Engineering

ME 8791 — MECHATRONICS

(Common to : Manufacturing Engineering/Mechanical Engineering
(Sandwich)/Mechanical and Automation Engineering/Production Engineering)

(Regulations 2017)

Time : Three hours                                      Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define sensitivity and precision.

2. What is seeback effect?

3. What are the buses in microprocessor?

4. Draw the clock circuit of 8085 using oscillator.

5. What are the operating modes of PPI?

6. Sketch the pin diagram of 8255.

7. Mention the programming methods of PLC.

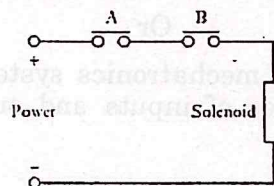8. Write the ladder program for the given circuit in figure 1.



Figure 1

9. Sketch the pneumatic control circuit of automatic car park barrier.

10. Furnish the ~~~~~~~ ~~~ks of stepper motor.

PART B — (5 × 13 = 65 marks)

11. (a) Discuss the construction and working of strain gauge and capacitive sensor.

Or

(b) Explain the construction and working of LVDT in details.

12. (a) Show the architecture of 8085 and explain the various functional blocks.

Or

(b) (i) Draw the Opcode fetch machine cycle of 8085. (5)

(ii) Illustrate the detailed architecture of 8051. (8)

13. (a) (i) Draw the block diagram of 8255 and summarise the pin functions of ports A, B and C for various modes of operation. (9)

(ii) Show the control word format for I/O mode operation of PPI 8255. (4)

Or

(b) Demonstrate the 4 × 4 Keyboard interfacing of 8255 with flowchart.

14. (a) Construct the ladder logic program for the following Boolean logic equations and logic gates,

(i) $Y = (X_1 + X_2)X_3$

(ii) $Y = (X_1 + X_2)(X_3 + X_4)$

(iii) $Y = (X_1 * X_2) + X_3$

(iv) NAND and NOR Gate

Or

(b) Brief the construction and I/O details of PLC with neat figure.

15. (a) With neat sketch discuss the construction and working of various types of stepper motors.

Or

(b) Discuss the step by step development procedure of mechatronics system design for integrated engineering product development.

PART C — (1 × 15 = 15 marks)

16. (a) Design a stepper motor interfacing with 8085 using 8255 PPI in detail.

Or

(b) Consider a engine as mechatronics system and with neat illustration show the various types of inputs and outputs of engine management systems.

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(b) Calculate the moment of inertia of L section shown in fig Q 13(b) below about the horizontal axis passing through the C.G.
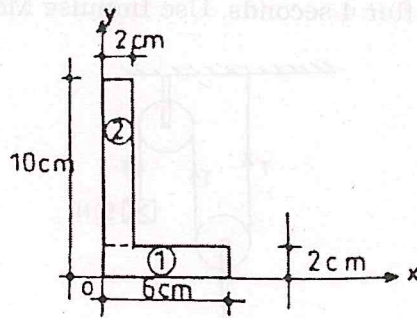


fig Q 13(b)

14. (a) What should be the value of the angle $\theta$ so that motion of the 390N block as shown in Fig.Q.14(a) impends down the plane? The coefficient of friction for all surfaces is 1/3.
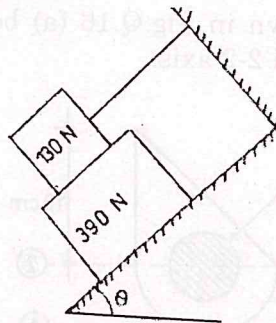


fig Q 14(a)

Or

(b) A 7m long ladder rest against a vertical wall, with which it makes an angle of 45° and on a floor. If a man whose weight is one half that of ladder climbs it, at what distance along the ladder will he be, when the ladder us about to slip? Take coefficient of friction between the ladder and the wall is 1/3 and that between the ladder and the floor is 1/2.

15. (a) Two weights 80 N and 20 N are connected by a thread and more along a rough horizontal plane under the action of a force 40 N, applied to the first weight of 80 N as shown in Fig Q 15 (a). The coefficient of friction between the sliding surface of the weights and the plane is 0.3. Determine the acceleration of the weight and the tension in the thread using work energy equation.
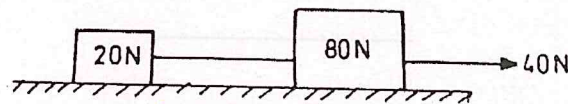


Fig Q 15 (a)

Or

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(b) Two blocks of weight 150 N and 50 N are connected by a string, passing over a frictonless pulley as shown in Fig.Q 15 (b). Determine the velocity of 150 N block after 4 seconds. Use Impulse Momentum method.
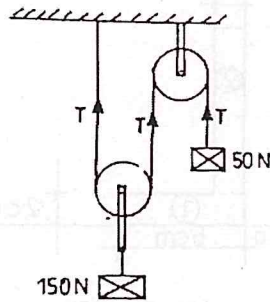


Fig Q 15 (b)

PART C — (1 × 15 = 15 marks)

16. (a) For the section shown in Fig.Q.16 (a) below, determine the moment of inertia about 1-1 and 2-2 axis.
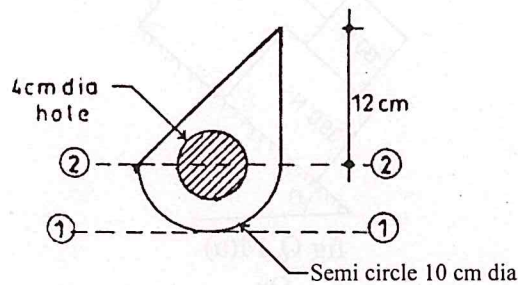


Fig.Q.16 (a)

Or

(b) A ball of mass 500 g, moving a velocity of 1 m/sec impinges on a ball of mass 1 kg, moving with a velocity of 0.75 m/sec. At the time of impact, the velocities of the balls are parallel and inclined at 60° to the line joining their centers. Determine the velocities and directions of the balls after impact. Take e = 0.6.