M. E. PRODUCTION ENGINEERING EXAMINATION 2018
FIRST YEAR, FIRST SEMESTER

AUTOMATION OF PRODUCTION SYSTEMS

Time: Three hours | Full Marks 100

Answer any FIVE questions
All parts of a question (a, b etc.) must be answered at one place.

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1. What is CIM? Explain different element of CIM system with the help of suitable diagram. Differentiate between automation and CIM.

4+10+6

2.(a) Derive the limiting conditions for which part leaves track in case of vibratory conveying.

(b) A special decal on the side of a vibratory bowl feeder indicates that the horizontal peak-to-peak amplitude of vibration is 0.25 mm. The angle of the supporting springs is such that the vibration at the bowl wall is inclined at an angle of 20 degrees to the horizontal. The coefficient of friction between parts and track is 0.2, the frequency of vibration is 60Hz, and the track is inclined at 5 degrees to the horizontal.

Determine:

(i) The actual value of A_n/g_n for the inclined track

(ii) The value of A_n/g_n for forward sliding to occur during the vibration cycle

(iii) The value of A_n/g_n for backward sliding to occur

(iv) Whether forward conveying will occur

(v) Whether hopping will occur

12+8

3.(a) With the help of net sketch describe the orienting mechanism for cup and U- shaped parts in vibratory bowl feeder.

12

(b) With the help of net sketch describe an active orienting device that can be used for orientation of rectangular blocks in vibratory bowl feeder.

8

4. (a) Discuss different types of feed track used for delivering parts to workhead.

(b) Give one example of simple escapement cum part placing mechanism with figure.

(c) Discuss ratchet escapement, slide escapement and gate escapement with neat sketches.

4+4+12

5.(a) Explain open loop and closed loop control system with help of an example and discuss their relative advantages and disadvantages.

(b) What do you mean by transfer function and block diagram of a system? Find out the closed-loop transfer function of a closed-loop control system from its feed forward and feedback transfer function.

(c) Fig. 5(c) shows a simplified schematic diagram of an automobile suspension system. Assume that the motion x_i at the point P is the input to the system and vertical motion x_o of the body is the output; obtain the transfer function $x_o(s)/x_i(s)$. Displacement x_o is measured from the equilibrium position in the absence of input x_i.

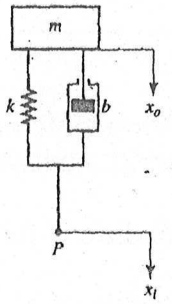

Fig. 5(c)

6+6+8

6.(a) Show an op-amp circuit that can be used as an PD controller. Find out the transfer function $E_o(s)/E_i(s)$ and there from determine the proportional and integral constant of the controller.

(b) Draw a schematic diagram of a positional servo mechanism using d.c. servomotor, and obtain the closed-loop transfer function of the system, assuming the input and output shaft positions as input and output of the system respectively.

6+14

7. Find out the unit step response of a second order system for different values of damping ratio.

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