



B.E DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Sixth Semester

MECHATRONICS ENGINEERING

U18MCE0002 : Condition Monitoring

COURSE OUTCOMES

- CO1:** Recognize the types of failures and maintenance strategies
- CO2:** Illustrate the fundamental principles of machinery vibration
- CO3:** Explain signal analysis, fundamentals of FFT and signal conditioning
- CO4:** Explain the vibration and noise based condition monitoring techniques
- CO5:** Explain the thermography and wear analysis for condition monitoring
- CO6:** Identify and explain the appropriate condition monitoring technique for a given application

Time: Three Hours

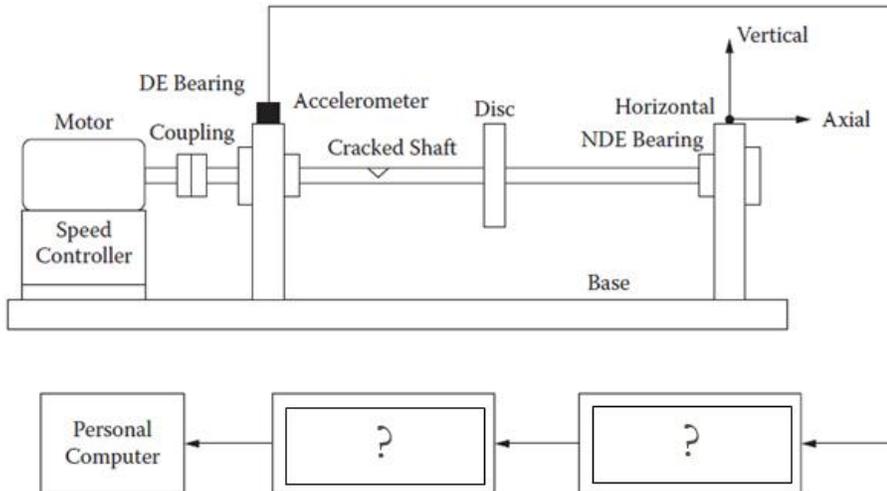
Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

1. Compare the types of maintenance strategy? CO6 [K₂]
2. Identify the missing element in the following block diagram. CO4 [K₂]

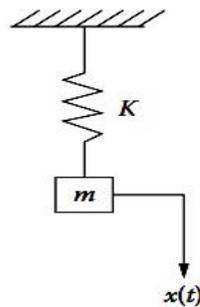


3. Explain the concept of force transmissibility in the context of forced vibration of single degrees of freedom system. CO2 [K₂]
4. Mention the significance of the vibration isolators. CO2 [K₂]
5. State the significance of FFT. CO3 [K₂]
6. Discuss the significance of Coherence Function. CO3 [K₂]

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| 7. | Give examples to preventive and predictive maintenance. | CO1 | [K ₂] |
| 8. | Compare A-weighted and C-weighted sound signals. | CO4 | [K ₂] |
| 9. | Mention the position of Infrared rays in the electromagnetic spectrum. | CO5 | [K ₂] |
| 10. | State the limits of oil analysis for condition monitoring. | CO5 | [K ₂] |

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

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| 11. | a) | Draw a curve between failure rate and time period. Explain the phases in the curve. | 6 | CO1 | [K ₃] |
| | b) | List the objectives of FMECA. Brief the steps to implement FMECA. | 10 | CO1 | [K ₂] |
| 12. | a) | Derive the equation of motion of a free vibration system with single degrees of freedom and without damping as shown in figure. | 10 | CO2 | [K ₃] |



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| | b) | What are the characteristics of a 'Simple Harmonic Motion'? | 6 | CO2 | [K ₃] |
| 13. | a) | Explain the transformation process of 'time domain signal' into 'frequency domain signal'. | 10 | CO3 | [K ₃] |
| | b) | Describe 'Computer-Aided Data Acquisition' for condition monitoring. | 6 | CO3 | [K ₂] |
| 14. | | List the components of the deep groove ball bearing. Discuss the fault detection frequencies of each component. | 16 | CO6 | [K ₃] |
| 15. | | Mention the significance of Sound fields in the placement of microphones. Also explain the various chambers. | 16 | CO4 | [K ₂] |
| 16. | a) | Explain how the principles of 'Thermography' used in the following: <ul style="list-style-type: none"> • Leakage Detection • Heat generator in Electrical and Electronic Components. • Building Conditions. • Machines | 8 | CO5 | [K ₂] |
| | b) | List the mechanisms of wear. Discuss the wear particle detection methods in detail. | 8 | CO5 | [K ₂] |
