Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Engineering Economy

Time: 3 hrs.   Max. Marks:100

Note: *Answer FIVE full questions, selecting*
atleast TWO questions from each part.

PART – A

1 a. Explain law of returns, giving reasons for increasing returns, constant returns and decreasing returns. **(10 Marks)**

   b. Find the future sum of Rs.10,000 after one year at an interest rate of 10% if the interest is compounded : annually, half yearly, quarterly and monthly. **(10 Marks)**

2 a. Initial investment, annual revenue and salvage value of two machines are 45,000 and 70,000, 15,000 and 20,000 ; 6,500 and 9000 respectively. Both have 7 years useful life. If nominal interest rate is 14%. Select the machine using present worth method. **(10 Marks)**

   b. Select the better alternative of the following if i = 9.75% compounded annually :

Year	0 (Rs.)	1 (Rs.)	2(Rs.)	3(RS.)	4(Rs.)
Alt X	–2,50,000	1,00,000	1,00,000	1,00,000	1,00,000
Alt Y	–3,00,000	1,40,000	1,10,000	90,000	1,00,000

(10 Marks)

3 a. For equivalent annual worth (EAW or AEW) comparison of alternatives having unequal lives, is it necessary to take LCM of their life? Why not? **(10 Marks)**

   b. The following alternatives can perform the same function. Rank their with i = 12%.

Alt	First cost Rs	Life years	Salvage value Rs.	Annual cost Rs.
A	6000	6	2000	800
B	3000	3	1000	1000
C	2000	3	Nil	1200

Use equivalent annual cost method. **(10 Marks)**

4 a. Explain the terms : minimum acceptable return, internal rate return, external rate of return and depreciation. **(10 Marks)**

   b. For an asset whose initial cost is Rs.10,000 and salvage value at the eight year is 2000 determine the depreciation amount for each year. Also find book value for each year using straight line method of depreciation. **(10 Marks)**

PART – B

5 a. Explain the terms : direct material cost, direct labour cost, overheads, total cost. **(10 Marks)**

   b. The various cost components for production of 30,000 units per annum are given : direct materials Rs. 6/- per unit, direct labour Rs 5/- per unit, fixed over heads Rs. 60,000 variable over heads Rs.2.50 per unit. Find the total cost and total cost/unit. **(10 Marks)**

6 a. List the items that appear in a profit and loss account. Present them in a logical order, ending with net project. **(10 Marks)**

   b. The following details as on 31/3/2014 are available for XYZ Co. Prepare a balance sheet as on 31/3/2014

   Fixed assets 58,125, Current Liabilities 45,050, Reserves and Surplus 47,550, Loans 25,180, Investments 2,635, Cash 6,555, Share Capital 45,075, Provision for Divided 3,525, Secured Loans 25,075, Debtors 26,555, Unsecured Loans 27,550, Stocks 77,050, Provision for Taxation 275. **(10 Marks)**

7 a. List profitability ratios and explain any two. **(10 Marks)**

   b. List activity ratios and explain any two. **(10 Marks)**

8 a. For a budget to result in profit, what essentials are necessary? Explain any one of them. **(10 Marks)**

   b. What is bench marking? List seven steps in bench marking with brief description. **(10 Marks)**

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Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Mechanical Vibrations

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1   a.   Define : (i)   Resonance
              (ii)   Phase difference
              (iii) Natural frequency   **(06 Marks)**
    b.   Explain the concept of vibration with Simple Harmonic Motion.   **(04 Marks)**
    c.   Represent the periodic motions given in the Fig.Q1(c) by harmonic series:
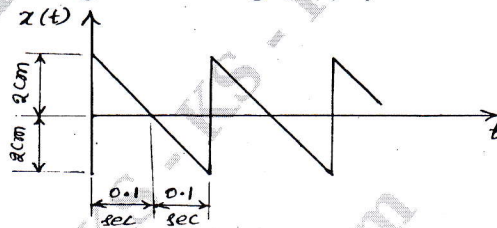

Fig.Q1(c)   **(10 Marks)**

2   a.   Derive natural frequency of spring mass system considering the effect of mass of spring.
                                                                        (10 Marks)
    b.   Determine the natural frequency of the vertical bar assuming the mass of the bar as 'm' with two unstretched springs as shown in the Fig.Q2(b). Is there any limitation on the value of 'K'.   **(10 Marks)**
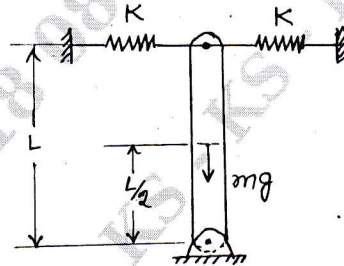

Fig.Q2(b)

3   a.   Set up the differential equation for a spring mass damper system and obtain complete solution for over damped condition.   **(10 Marks)**
    b.   The disc of a torsional pendulum has a moment of inertia of 600 kg-cm² and is immersed in a viscous fluid. The brass shaft, which carries the disc is attached to it. When the pendulum vibrates, the observed amplitudes on the same side of the rest position for successive cycles are 9°, 6° and 4°. Determine (i) Logarithmic decrement (ii) Damping torque/unit velocity (iii) The periodic time of vibration (iv) The frequency if the disc is removed from the fluid. Assume for the brass shaft, $G = 4.4 \times 10^{10}$ N/m², d = 0.10m, l = 0.40 m, moment of inertia of disc = 0.06 kg-m².   **(10 Marks)**

4 a. Explain briefly the excitation due to rotating unbalance and reciprocating unbalance.
(10 Marks)

b. A weight of 54 N is suspended by a spring with a stiffness of 1100 N/m. It is forced to vibrate by a harmonic force of 5 N. Assuming a viscous damping of 77 N-s/m, find (i) Amplitude at resonance (ii) Phase angle at resonance (iii) Damped natural frequency (iv) Frequency at which maximum amplitude occurs (v) Peak amplitude. (10 Marks)

PART – B

5 a. Derive an expression for deflection of the shaft with a disc at the centre with an eccentricity from the shaft axis neglecting damping. (10 Marks)

b. A vertical shaft 14 mm diameter rotates in long bearings and a disc of mass 16 kg is attached to the mid span of the shaft. The snap of the shaft between the bearings is 1.2m. The mass centre of the disc is 0.4 mm from the axis of the shaft. Neglecting the mass of the shaft and taking the deflection as for beam fixed at both ends, determine the critical speed of rotation. Also determine the range of speed over which the stress in the shaft due to bending will not exceed 70×10^6 N/m². Take E = 200 GN/m². (10 Marks)

6 a. Derive expressions for natural frequencies of the system shown in the Fig.Q6(a) and sketch the mode shapes. (12 Marks)
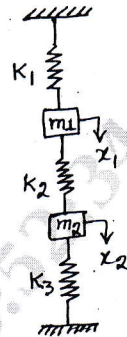

Fig.Q6(a)

b. A motor drives a centrifugal pump through gearing, the pump speed being one-third of the motor. The shaft from the motor to the pinion 60mm diameter and 300 mm long. The moment of inertia of the motor is 400 kg-m². The impeller shaft is 100 mm diameter and 600mm long. The moment of inertia of the impeller is 1500 kg-m². Neglecting the inertia of the gears and the shaft determine the frequency of torsional vibration of the system. The modulus of rigidity of the shaft material is 80 GN/m². (08 Marks)

7 a. A simply supported beam subjected to UDL and concentrated loads as shown in the Fig.Q7(a). Determine the fundamental natural frequency of transverse vibration by Dunkerley's method. Take diameter of the shaft as 180 mm and E = 2×10^{11} N/m². (10 Marks)
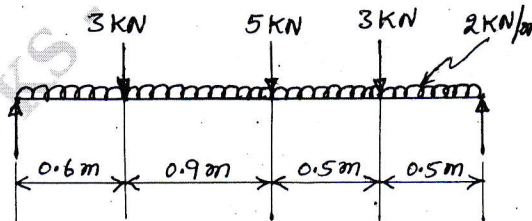

Fig.Q7(a)

b. Determine the natural frequency of the system shown in the Fig.Q7(b) by using Rayleigh's method. **(10 Marks)**
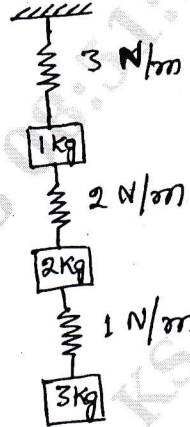

Fig.Q7(b) **(10 Marks)**

8   a. Explain signal analysis and dynamic testing of machines and structures. **(10 Marks)**
    b. Explain experimental modal analysis. **(10 Marks)**

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Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Hydraulics and Pneumatics

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　　　　　Max. Marks:100

Note: *Answer FIVE full questions, selecting*
at least TWO full questions from each part.

PART – A

1　a. What are the advantages and limitations of a hydraulic system? **(06 Marks)**
　　b. Explain the working of axial piston pump with a neat sketch. **(08 Marks)**
　　c. A gear pump has 75mm outside diameter, 50mm inside diameter and 25mm width. If the volumetric efficiency is 90%, what is the corresponding actual flow rate? The pump speed is 1000rpm. **(06 Marks)**

2　a. Explain with a neat sketch the working of a single acting cylinder. **(06 Marks)**
　　b. With a neat sketch, explain first class lever system used with hydraulic cylinders to drive load. **(08 Marks)**
　　c. A hydraulic motor has a displacement of $130cm^3$ and operates with a pressure of 105 bar and speed of 2000rpm. If the actual flow rate consumed by the motor is 0.005 m^3/s and the actual torque delivered by the motor is 200 N-m find i) η_v ii) η_m iii) η_o. **(06 Marks)**

3　a. Explain the working of shuffle valve with a sketch. **(06 Marks)**
　　b. Explain the operation of sequence valve with a neat sketch. **(08 Marks)**
　　c. Give the symbol for the following:
　　　Pilot operated check valve, pressure sequence valve, pressure reducing valve, variable flow control valve four way three position with float neutral, four way three position with regenerative neutral? **(06 Marks)**

4　a. Explain the control of double acting cylinder with a sketch. **(06 Marks)**
　　b. Explain hydraulic cylinder sequencing circuit with a sketch. **(08 Marks)**
　　c. Explain the difference between meter-in and meter-out circuit with a sketch. **(06 Marks)**

PART – B

5　a. Explain any six service properties of hydraulic fluids. **(06 Marks)**
　　b. Explain the reservoir system with a neat sketch. **(08 Marks)**
　　c. Explain the general types of hydraulic fluids. **(06 Marks)**

6　a. Give the classification of air cylinders. **(06 Marks)**
　　b. Explain the structure of pneumatic control system with a neat sketch. **(08 Marks)**
　　c. Explain the rodless cylinder with a neat sketch. **(06 Marks)**

7　a. Explain the sliding spool type of DCV with a sketch. **(06 Marks)**
　　b. Explain with a suitable circuit diagram application of the memory valve. **(06 Marks)**
　　c. With a neat sketch, explain how following functions are generated in pneumatic system i) AND function ii) OR function. **(08 Marks)**

8　a. Explain displacement step diagram for stamping operation. **(06 Marks)**
　　b. Explain use of relay with a sketch. **(06 Marks)**
　　c. Explain air filter for pneumatic system with a neat sketch. **(08 Marks)**

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Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Operations Research

Time: 3 hrs.   Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting*
atleast TWO questions from each part.
2. Use of normal distribution chart is permitted.

PART – A

1 a. List and explain different phases of operations research.   **(06 Marks)**
   b. Solve the following LP problem graphically :
      Minimize $z = 2x_1 + 1.5x_2$
      Subject to $x_1 + x_2 = 50$
                      $0.15x_1 - 0.05x_2 \geq 0$
                      $0.02x_1 - 0.03x_2 \geq 0$
                      $-0.05x_1 + 0.15x_2 \geq 0$
                      $x_1, x_2 \geq 0.$ **(14 Marks)**

2 a. Solve the following LPP by Big-M method :
      Minimum $Z = 2x_1 + x_2$
      Subject to $3x_1 + x_2 = 3$
                $4x_1 + 3x_2 \geq 6$
                $x_1 + 2x_2 \leq 3$
                $x_1, x_2 \geq 0.$ **(15 Marks)**
   b. Write the dual of the following LPP :
      maximum $Z = 3x_1 + 2x_2 + 1x_3$
      subject to $5x_1 + 2x_2 + 3x_3 = 6$
                      $2x_1 + 3x_2 + x_3 \geq 2$
                      $x_1 + 2x_2 + 6x_3 = 5$
                      $x_1, x_2, x_3 \geq 0.$ **(05 Marks)**

3 a. Obtain basic feasible solution for the following transportation problem by
      i)   North–West corner rule
      ii) Matrix minima method
      iii) Penalty method.   **(10 Marks)**

To / Form	1	2	3	4	5	Capacity
A	5	8	6	6	3	800
B	4	7	7	6	5	500
C	8	4	4	6	4	900
Demand	400	400	500	400	800	

   b. Solve the travelling salesman problem for the following data :
      $C_{12} = 20$ $C_{13} = 4$ $C_{14} = 10$ $C_{35} = 6$ $C_{23} = 5$ $C_{25} = 10$ $C_{34} = 6$ $C_{54} = 20$
      Where $C_{ij} = C_{ji}$ and there is no route between cities i and j the values for C_{ij} is not given.
                                                                                                   (10 Marks)

4 Solve the following integer programming problem by Gomory cutting plane method :

Maximum $Z = 3x_1 + 4x_2$

Subject to $2x_1 + x_2 \leq 6$

$2x_1 + 3x_2 \leq 9$

$x_1, x_2 \geq 0$ and integers. **(20 Marks)**

PART – B

5 a. Explain the Fulkerson rule of numbering of nodes with the help of an example. **(05 Marks)**

b. A project consists of the activities as given in the table below :

Activity	Immediate predecessor	Time in weeks		
		t_0	t_p	t_ℓ
A	–	1	7	1
B	A	1	7	4
C	–	2	8	2
D	B, C	1	1	1
E	C	2	14	5
F	A, C	2	8	5
G	D	3	15	6

i) Draw the project network and find the critical path. **(10 Marks)**

ii) What is the probability of completing the project in 17 weeks? **(05 Marks)**

6 a. Briefly explain the characteristics of queue. **(06 Marks)**

b. A barbar runs a one-man shop. Customers arrive on FCFS basis follows a Poisson pattern with a mean arrival rate of 30/hour. The barbar's service time appears to be exponentially distributed with a mean of 1.5 minute. Determine :

i) The expected number of customers in the shop

ii) The expected number of customers waiting for service

iii) The average time a customer should expect to wait for service

iv) The probability that the service is idle. **(14 Marks)**

7 a. Briefly explain the following terms with reference to game theory :

i) Saddle point   ii) Pure strategy   iii) Pay-off iv) Mixed strategy. **(08 Marks)**

b. Two players A and B playing matching coins game in which each player has 4 coins ; a 1 Rs, a 2 Rs., a 5 Rs and a 10 Rs. Each player selects a coin without the knowledge of others choice. If the sum of the coins amount is an odd, player–A wins player–B's coin. If the sum the coins amount is even, B wins A's coin. Formulate this problem as game theory problem and find the optimal strategies for each player and game value. **(12 Marks)**

8 a. Briefly explain the Johnson algorithm for finding the sequence for 'n' jobs through 2 machines. **(04 Marks)**

b. Find the sequence that minimizes the total elapsed time required to complete the following tasks :

Task	A	B	C	D	E	F	G
Time on M/c-1(Hrs)	3	8	7	4	9	8	7
Time on M/c-2(Hrs)	4	3	2	5	1	4	3
Time on M/c-3(Hrs)	6	7	5	11	5	6	12

Also find the percentage of utilization and idle time of each machine. **(16 Marks)**

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Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019

Total Quality Management

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1 a. Give the change in culture required to implement total quality management. **(05 Marks)**
    b. List the benefits of total quality management. **(05 Marks)**
    c. Explain contribution made by any two quality Guru's. **(10 Marks)**

2 a. Enumerate Deming's 14 principles and explain any two of them. **(10 Marks)**
    b. Define leader. Explain the characteristics of a quality leader. **(10 Marks)**

3 a. Explain the performance appraisal and its formats highlighting their disadvantages.
                                                                  (10 Marks)
    b. What is customer feedback? Explain different tools used to collect feedback. **(10 Marks)**

4 a. What is bench marking? Explain the steps in bench marking. **(10 Marks)**
    b. Write a brief note on Kaizen. **(05 Marks)**
    c. With a neat sketch, explain the Juran tribology. **(05 Marks)**

PART – B

5 a. List out the seven steps involved in the application of forced field technique. **(08 Marks)**
    b. Explain the following:
      i) Tree-diagram
      ii) Matrix-diagram **(12 Marks)**

6 a. List the objectives of control charts for variables. **(05 Marks)**
    b. Explain the following:
      i) Histograms
      ii) Pareto diagrams
      iii) Scatter diagrams **(15 Marks)**

7 a. Write a note on Six Sigma. **(06 Marks)**
    b. List the benefits of ISO registration. **(08 Marks)**
    c. Write a note on BALD RIDGE. **(06 Marks)**

8 a. Explain the tools for concept development. **(07 Marks)**
    b. Explain the tools for design verification. **(07 Marks)**
    c. Explain the tools for design optimization. **(06 Marks)**

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Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Tool Design

Time: 3 hrs.   Max. Marks:100

Note: *Answer FIVE full questions, selecting*
at least TWO questions from each part.

PART – A

1. a. Explain briefly the general design procedure. **(10 Marks)**
   b. In an orthogonal cutting of a mild steel bar on a lathe the feed (f_1) is 0.33mm/rev and depth of cut (t) is 2mm. Determine the cross section of rectangular tool shank if the allowable stress in the shank material is 7 kg/m^2 and the cutting force (F_H) can be calculated by the relation $F_H = 200 \times f_1^{0.75} \times t$. **(05 Marks)**
   c. With neat sketch explain different chip breakers. **(05 Marks)**

2. a. Draw a neat sketch of twist drill and explain the different elements of it. **(10 Marks)**
   b. Explain the following design features of milling cutter
      - (i) size of cutter
      - (ii) Tool angles
      - (iii) Number of teeth. **(10 Marks)**

3. a. Explain 3 – 2 – 1 principle of location. **(10 Marks)**
   b. Briefly explain with neat sketches
      - (i) Swinging leaf jig and
      - (ii) Box type jig. **(10 Marks)**

4. a. State the design points considered for lathe fixture. **(05 Marks)**
   b. With neat sketch, explain taper mandrel used as fixture for external grinding. **(10 Marks)**
   c. List the functions required to be performed by broaching fixtures. **(05 Marks)**

PART – B

5. a. Explain the classification of presses. **(05 Marks)**
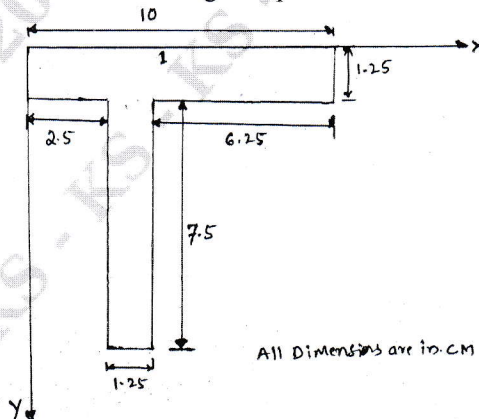   b. Find the centre of pressure for the following components. shown in Fig Q5(b)

Fig Q5(b) **(10 Marks)**
   c. Explain the term "shear" on die and punch for reducing cutting force. **(05 Marks)**

6 a. Explain following terms associated with bending operation
    (i)   Bend allowance
    (ii) Spring back
    (iii) Spanking.   **(06 Marks)**

   b. A 37.5cm long, 19mm wide and 2.5mm thick strip is to be bent in a V-shaped die. Calculate the bending force necessary if the steel has 630 N/mm^2 tensile strength. (Take die opening factor K= 1.20.   **(04 Marks)**

   c. Briefly explain the factors affecting drawing.   **(05 Marks)**

   d. Explain working of inverted draw die.   **(05 Marks)**

7 a. Define die casting and state the important characteristics of die casting alloys.   **(07 Marks)**

   b. With neat sketch describe multicavity die and state its advantages.   **(08 Marks)**

   c. Explain the defects in die casting process.   **(05 Marks)**

8 a. Briefly explain :
    (i)   Sprue
    (ii) Gate
    (iii) Cove
    (iv) Runner
    (v) Parting surface.   **(10 Marks)**

   b. Describe any four methods of ejection used in injection moulding.   **(10 Marks)**

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