CBCS SCHEME

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17ME51

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Management and Engineering Economics

Time: 3 hrs. Max. Marks: 100

Note: 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Use of Compound Interest Tables is permitted.***

Module-1

1 a. Explain various functions of Management. **(10 Marks)**

b. Define Planning. Discuss steps commonly used in planning. **(10 Marks)**

OR

2 a. Explain principles of Management as formulated by Fayol. **(10 Marks)**

b. Explain the various steps in a decision making process, with a block diagram. **(10 Marks)**

Module-2

3 a. Explain the staff selection process in an organization listing the steps involved in the selection. **(10 Marks)**

b. Define Leadership. List the basic styles of leadership, briefly explaining each of them. **(10 Marks)**

OR

4 a. Define Controlling. Explain the steps involved in controlling. **(10 Marks)**

b. What is Span of Control? Explain the factors governing it. **(10 Marks)**

Module-3

5 a. Differentiate between Micro and Macro economics. **(04 Marks)**

b. Explain briefly with sketch : i) Law of demand ii) Law of supply. **(06 Marks)**

c. A working woman is planning for her retired life. She has 20 more years of service. She would like to deposit 10% of her salary which is Rs 5000 at the end of the first year and thereafter she wishes to deposit the same amount (Rs 5000) with the annual increase of Rs 1000 for the next 19 years with an interest rate of 18%. Find the total amount at the end of 20 years of service. **(10 Marks)**

OR

6 a. Explain the problem solving process in decision making with suitable examples. **(06 Marks)**

b. Explain Elasticity of demand, with an example. **(04 Marks)**

c. Find the effective rate of interest if the nominal annual rate of interest is 8%, when compounded : i) Yearly ii) Biannually iii) Quarterly iv) Monthly v) Daily. Compare the results. **(10 Marks)**

Module-4

7 a. Explain with suitable example : i) Present worth comparison method ii) Future worth comparison method iii) Annual worth equivalent method. **(10 Marks)**

b. Compare the alternative below using present worth analysis at i = 10%.

Particulars	Machine A	Machine B
First cost	Rs 20000	Rs 30000
Annual cost	Rs 9000	Rs 7000
Salvage value	Nil	Nil
Life	3 years	6 years

(10 Marks)

OR

8 a. Explain IRR, ERR and MARR. Enlist the misconcepts of ERR. **(08 Marks)**

b. A certain individual firm derives and economic analysis to determine which of the two machines is attractive in a given interval of time. The minimum attractive rate of return is 15%. Following data to be used for analysis.

Particulars	Machine X	Machine Y
First cost	Rs 150000	Rs 240000
Estimated life	12 years	12 years
Salvage value	0	6000
Annual maintenance cost	0	Rs 4500

Which machine you would choose? Base your answer on annual equivalent cost. **(12 Marks)**

Module-5

9 a. Explain the following terms : i) Prime cost ii) Factory cost iii) Office cost iv) Total cost v) Selling price. **(10 Marks)**

b. A manufacturing firm is producing 1000 pens/day. The cost of direct material is Rs 1600/- and that of direct labour is Rs 2000/-. Factory overheads chargeable to it are Rs 2500. If the selling on cost is 40% of factory cost, what must be the selling price of each pen to realize a profit of 20% on each pen sold? **(10 Marks)**

OR

10 a. What is Depreciation? List different methods of determining depreciation. Explain any two of them. **(10 Marks)**

b. A Company purchases a lathe machine for Rs 500000 for operating it for 5 years at an interest rate of 5%. If the salvage value is Rs 60000 after 5 years, determine
i) Sinking fund amount ii) Annual depreciation cost. **(10 Marks)**

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17ME53

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Turbomachines

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define specific speed of turbine and hence derive an expression for specific speed of turbine. **(06 Marks)**

b. A Pelton wheel is running at a speed of 200rpm and develops 5200KW when working under a heat of 220m with an overall efficiency of 80%. Determine its unit speed, unit flow, unit power and specific speed. Find the speed, flow and power when its operating condition changes to a head of 140m. **(08 Marks)**

c. A full scale centrifugal pump running at 500rpm delivers $5m^3/s$ against a head of 100m. A model of the pump delivers $0.3m^3/s$ with a power input of 100KW at an efficiency of 90%. Calculate the speed of the model and scale ratio. **(06 Marks)**

OR

2 a. Applying First law of thermodynamics to turbomachines, prove that the work transfer is numerically equal to the change in total enthalpy between inlet and outlet of the machine. **(06 Marks)**

b. With the help of h-s diagram define the following with respect to turbines :
i) Total–to–total efficiency
ii) Total–to–static efficiency. **(06 Marks)**

c. Liquid water flows through pump from an elevation of 1m at the inlet to an elevation of 2m at the exit from the centre of the pump respectively. The static pressure increases from 10cm to 150cm of mercury between the inlet and exit. The inlet and exit velocities are 5m/s and 10m/s respectively. Evaluate the isentropic enthalpy increase across the pump. Also find the power required to drive the pump and the actual change in enthalpy if the total – to – total isentropic efficiency of the pump is 75%. The mass flow rate of water in pump is 100kg/min. **(08 Marks)**

Module-2

3 a. Define degree of reaction and utilization factor. Obtain the general equation for utilization factor in terms of degree of reaction, absolute velocities at inlet and outlet of the turbine. **(08 Marks)**

b. At a stage of an impulse turbine, the mean blade diameter is 0.75m, its rotational speed being 3500rpm. The absolute velocity of fluid exiting from a nozzle inclined at 20° to the wheel tangent is 275m/s. If the utilization factor is 0.9 and the relative velocity at rotor exit is 0.9 times that at inlet, find the inlet and exit rotor angles. Also find the power output from the stage for a mass flow rate of 2 kg/s and axial thrust on the shaft. **(12 Marks)**

OR

4 a. Prove that the degree of reaction for an axial flow compressor is given by

$$R = \frac{V_a}{2U}\left[\frac{\tan\beta_2 + \tan\beta_1}{\tan\beta_1 + \tan\beta_2}\right]$$

Where V_a = Axial component or flow velocity, U = tangential velocity of rotor, β_1 and β_2 are the rotor angles at inlet and exit measured with reference to tangential direction. **(10 Marks)**

b. A single stage axial flow blower with no inlet guide vanes, operates at 3600rpm. The tip and hub diameters of the rotor are 20cm and 12.5cm respectively. The air flow through the stage is 0.45kg/s. The air turned through an angle of 20° towards the axial direction during the passage through the rotor at the mean diameter. Assuming the inlet conditions of pressure of 1 bar and 25°C, constant axial velocity and no losses in the rotor, compute :
i) The power input in KW ii) degree of reaction. **(10 Marks)**

Module-3

5 a. Derive the condition for maximum blade efficiency with equip-angular blades in an impulse steam turbine. **(08 Marks)**

b. In a Curtis stage with two rows of moving blades, the rotors are equiangular. The first rotor has angle of 29° each while second rotor has angle of 32° each. The velocity of steam at the exit of nozzle is 530m/s and blade coefficients are 0.9 in the first moving row, 0.95 in the stator and in the second moving row. If the absolute velocity at the stage exit should be axial, find :
i) Mean blade speed
ii) The rotor efficiency
iii) The power output for a steam flow rate of 1kg/s. **(12 Marks)**

OR

6 a. Prove that the maximum blade efficiency in a Parason's reaction steam turbine is given by :

$$\eta_{b,max} = \frac{2\cos^2\alpha_1}{1+\cos^2\alpha_1}.$$ **(08 Marks)**

b. At a stage of a turbine with Parasons's blading deliver dry saturated steam at 2.7 bar form fixed blades at 90m/s. The mean blade height is 40mm, and the moving blade exit angle is 20°. The axial velocity of steam is ¾ times the blade velocity at the mean radius. Steam is supplied to the stage at the rate of 9000kg/h. The effect of blade tip thickness on the annulus area can be neglected calculate : i) the wheel speed in RPM ii) the diagram efficiency iii) the diagram power iv) the enthalpy drop of the steam in this stage. **(12 Marks)**

Module-4

7 a. With the necessary velocity triangles, show that the maximum hydraulic efficiency of a Pelton wheel is given by $\eta_{H,max} = \frac{1+c_b\cos\beta_2}{2}$, where $c_b = V_{r2}/V_{r1}$ and β_2 is bucket tip angle. **(08 Marks)**

b. A double jet Pelton wheel is required to generate 7500KW when the available head at the base of the nozzle is 400m. The jet is deflected through 165° and the relative velocity of the jet is reduced by 15% in passing over the buckets. Determine : i) The diameter of each jet ii) total flow iii) force exerted by the jets in the tangential direction. Assume generator efficiency is 95%, overall efficiency is 80% and speed ratio = 0.47. **(12 Marks)**

OR

8 a. For Francis turbine, show that the hydraulic efficiency = $\frac{2}{2+\tan^2\alpha_1}$ for the following conditions : i) the component of velocity normal to the tangential direction is constant from inlet to outlet ii) relative velocity at the inlet is radial iii) absolute velocity at the outlet is radial. Where α_1 = flow angle at inlet. Sketch the velocity triangles at inlet and outlet. **(08 Marks)**

b. An inward flow reaction turbine has a runner 0.5m diameter an d7.5cm wide. The inner diameter is 0.35m. The effective area of flow is 93% of the gross area and the flow velocity is constant. The guide vane angle is 23° inlet moving vane angle is 97° and the outlet vane angle is 30°. Assuming radial discharge at the exit, calculate the speed of the wheel so that the water enters without shock and the supply head of 60m. Assume hydraulic friction losses of 10% and mechanical efficiency as 94%. What is the specific speed of the machine? **(12 Marks)**

Module-5

9 a. Show that the pressure rise in the impeller of a centrifugal pump, when the frictional and other losses in the impeller are neglected, is given by

$$\frac{1}{2g}\left[V_{f1}^2 + u_2^2 - V_{f2}^2 \operatorname{cosec}^2\beta_2\right] .$$

Where V_{f1} and V_{f2} are the flow velocities at inlet and out let of the impeller, u_2 = tangential velocity of the impeller at exit and β_2 = exit blade angle. **(08 Marks)**

b. Derive an expression for minimum speed of CF pump to start the flow. **(04 Marks)**

c. Find the power required to drive the CF pomp which delivers 0.04m^3/p of water t a height of 20m through a 15cm diameter of pipe and 100m long. The overall efficiency of the pump is 70% and the friction factor is assumed to be 0.015. **(08 Marks)**

OR

10 a. Explain the phenomena of :
Surging
Stalling and
Choking in a centrifugal compressor stage. **(06 Marks)**

b. Show that the H-Q characteristic equation for centrifugal blower is given by

$$H = K_1 - K_2 Q$$

Where $K_1 = u_2^2/g$, $K_2 = \frac{u_2 \cot\beta_2}{g, \pi D_2 \cdot b_2}$. **(06 Marks)**

c. An axial flow compressor of 50% reaction design has blades with inlet and outlet angle with reference to axial direction of 45° and 10° respectively. The compressor is to produce a pressure ratio of 6 : 1 with an isentropic efficiency of 0.85 when inlet static temperature is 37°C. The blade speed and axial velocity are constant throughout the compressor. Assuming a blade speed of 200m/s, find the number of stages required if the work done factor is i) unity ii) 0.87 for all stages. **(08 Marks)**

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17ME54

Fifth Semester B.E. Degree Examination, Jan./Feb.2021
Design of Machine Elements – I

Time: 3 hrs. Max. Marks: 100

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *Use of design data hand book is allowed.*
3. *Assume suitable missing data (if any).*

Module-1

1 a. Define standards and codes. **(04 Marks)**

b. A circular rod of diameter 60 mm is subjected to bending load and torsional load as shown in Fig. Q7 (b). Determine the nature and magnitude of stresses at the critical points. **(16 Marks)**

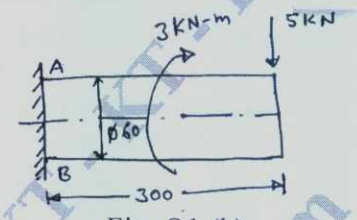

Fig. Q1 (b)

OR

2 a. Define stress concentration and stress concentration factor. **(04 Marks)**

b. Determine the safe load that can be carried by a bar of rectangular cross section as shown in Fig. Q2 (b) limiting the maximum stress to 130 MPa taking stress concentration into account. **(16 Marks)**

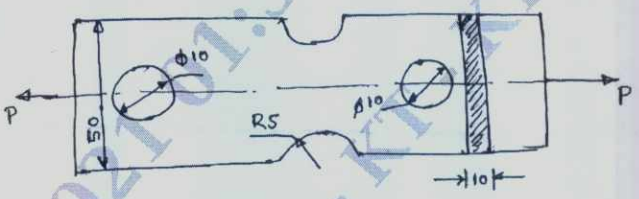

Fig. Q2 (b)

Module-2

3 a. Derive an equation for impact stress due to axial load. **(08 Marks)**

b. A weight of 1 kN is dropped from a height of 50 mm at the free end of a Cantilever beam of effective length 300 mm. Determine the cross section of the Cantilever beam of square cross section. If the allowable stress in material of beam is limited to 80 MPa. ($E = 206.8 \times 10^3$ N/mm^2). **(12 Marks)**

OR

4 a. Derive an equation for Goodman criterion. **(08 Marks)**

b. A piston rod is subjected to a maximum reversed axial load of 110 kN. It is made of steel having an ultimate stress of 90 N/mm^2 and the surface is machined. The average endurance limit is 50% of ultimate strength. Take the size correction coefficient as 0.85 and factor of safety = 1.75. Determine the diameter of the rod. **(12 Marks)**

Module-3

5 A shaft is supported by two bearing placed 1100 mm apart. A pulley of diameter 620 mm is keyed at 400 mm to the right from the left hand bearing and this drives a pulley directly below it with maximum tension of 2.75 kN. Another pulley of diameter 400 mm is placed 200 mm to the left of right bearing and is driven with motor placed horizontally to the right. The angle of contact of pulley is 180° and $\mu = 0.3$. Find the diameter of shaft $C_m = 3.0$, $C_t = 2.5$, $\sigma_y = 190$ MPa, $\sigma_{ut} = 300$ MPa **(20 Marks)**

OR

6 Design a protected type cast iron flange coupling for a steel shaft transmitting 30 kW at 200 rpm. The allowable shear stress in the shaft and key material is 40 MPa. The maximum torque transmitted to be 20% higher than the full load torque. The allowable shear stress in the bolt is 60 MPa and the allowable shear stress in the flange is 40 MPa. **(20 Marks)**

Module-4

7 a. A double riveted lap joint is to be made between 9 mm plates. If the safe working stresses in tension, crushing and shear are 80 N//mm^2, 120 N/mm^2 and 60 N/mm^2 respectively, design the riveted joint. **(10 Marks)**

b. Find the diameter of the rivet as shown in Fig. Q7(b). The maximum shearing stress on the most heavily loaded rivet is 56 N/mm^2. **(10 Marks)**

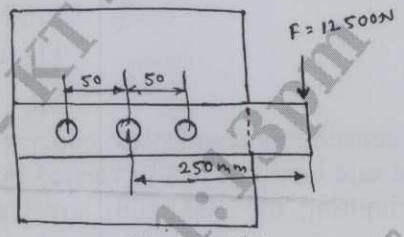

Fig. Q7 (b)

OR

8 a. A welded connection of steel plates shown in Fig. Q8 (a) subjected to eccentric load 10 kN. Determine size of weld. If permissible stress limited to 95 N/mm^2. Assume static conditions. **(10 Marks)**

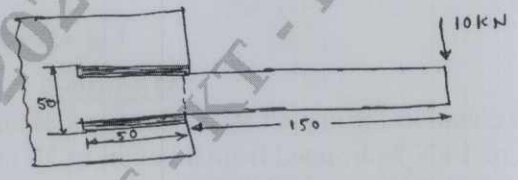

Fig. Q8 (a)

b. Determine the allowable stress in the joint as shown in Fig.Q8 (b), if the size of weld 10 mm. **(10 Marks)**

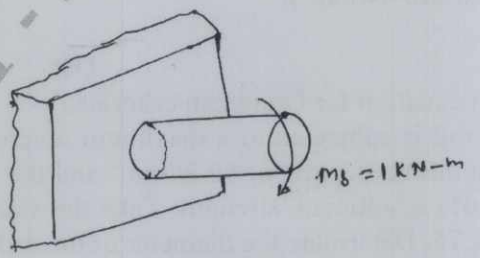

Fig. Q8 (b)

Module-5

9 a. A pulley brocket is as shown in Fig. Q9 (a) supported by 4 bolts, two at A – A and two at B – B. Determine the size of bolts using an allowable shear stress of 25 N/mm^2 for the material of the bolts. **(10 Marks)**

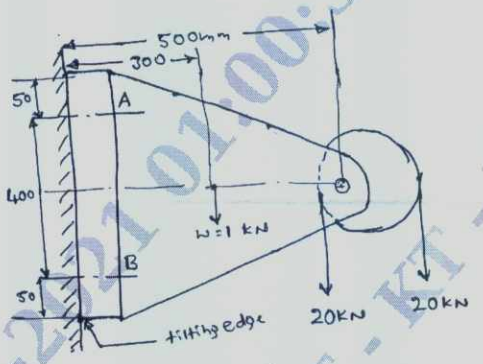

Fig. Q9 (a)

b. The structural connection shown in Fig. Q9 (b) is subjected to eccentric load 10 kN with an eccentricity of 500 mm. The center distance between bolts at 1 and 3 is 150 mm and center distance between 1 and 2 is 200 mm, all bolts are identical. The bolts are made of plain carbon steel with yield strength of 400 MPa and F.O.S is 2.5. Determine size of bolts. **(10 Marks)**

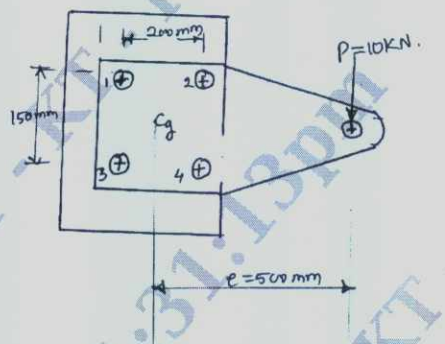

Fig. Q9 (b)

OR

10 a. A power screw for a jack has square threads of propotion $50 \times 42 \times 8$. The coefficient of friction at threads 0.1 and collar 0.12. Determine the weight lifted is jack with human effort of 400 N, through hand lever of span 400 mm. **(10 Marks)**

b. A single threaded power screw has a major diameter restriction of 36 mm. Design the screw if the frictional coefficient for thread and collar 0.13 and 0.1 respectively. Estimate the power input to rotate screw at 1 rpm, if the load lifted is 5 kN. **(10 Marks)**

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17ME554

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Non-Traditional Machining

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. List and explain the various factors to be considered for selection of machining process. **(10 Marks)**

b. Distinguish between conventional and unconventional manufacturing process. **(10 Marks)**

OR

2 a. Explain how the non-traditional machining processes are classified. **(10 Marks)**

b. Justify the need of unconventional manufacturing process in today's industries with suitable examples. **(10 Marks)**

Module-2

3 a. Sketch and explain the working principle of ultrasonic machining process. **(10 Marks)**

b. Explain with neat sketch various tool feed mechanisms used in ultrasonic machining process. **(10 Marks)**

OR

4 a. Explain in details the process parameters that effect the performance of abrasive jet machining process. **(10 Marks)**

b. With neat sketch, explain the working of water jet machining process. **(10 Marks)**

Module-3

5 a. Explain the process parameters of electro-chemical machining process. **(10 Marks)**

b. With neat sketch, explain the working principle of electro chemical machining. Also list the advantages and disadvantages of electrochemical machining. **(10 Marks)**

OR

6 a. Explain with neat block diagram, process steps for chemical milling. **(10 Marks)**

b. Explain with block diagram steps involved in chemical blanking. **(10 Marks)**

Module-4

7 a. Explain with neat sketch plasma arc machining process. **(10 Marks)**

b. What are the factors that govern the performance of plasma arc machining? Explain in detail any two factors. **(10 Marks)**

OR

8 a. Explain with the help of neat sketches, the mechanism of metal removal in EDM process and mention its advantages and disadvantages. **(10 Marks)**

b. Explain with sketch the electrode feed control in electric discharge machining process. Also, explain any two methods of flushing used in EDM. **(10 Marks)**

Module-5

9 a. With neat sketch, explain laser beam machining process. **(10 Marks)**

b. Discuss various process parameters of LBM process. Also, list the advantages and disadvantages of LBM. **(10 Marks)**

OR

10 a. Explain with neat sketch the working principle of electron beam machining process. **(10 Marks)**

b. Describe the apparatus used to generate the laser. **(05 Marks)**

c. Discuss the parameters influencing MRR in EBM. **(05 Marks)**

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17ME562

Fifth Semester B.E. Degree Examination, Jan./Feb.2021
Energy and Environment

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. List and explain the different forms of energy. **(10 Marks)**

b. Explain briefly the key energy trends in India. **(10 Marks)**

OR

2 a. Outline the factors that affect India's Energy development. **(10 Marks)**

b. Explain briefly world energy scenario with respect to production and consumption using relevant statistics. **(10 Marks)**

Module-2

3 a. List the different types of thermal energy storage systems. Explain any two of them. **(10 Marks)**

b. Elaborate the benefits of thermal energy storage. **(10 Marks)**

OR

4 a. Define Energy Audit. Explain the need for Energy Audit. **(10 Marks)**

b. A power plant of 210 MW installed capacity has the following particulars:
Capital cost : Rs.18,000/kW installed.
Interest and depreciation = 12%
Annual load factor = 60%
Annual capacity factor = 54%
Annual running charges = Rs. 2×10^8
Energy consumed by auxiliaries = 6%
Calculate the cost of power generation per kWh. **(10 Marks)**

Module-3

5 a. Identify the need for public awareness on environment management. Discuss the effort of important institution and people in environment management. **(10 Marks)**

b. Explain with a suitable examples, multidisciplinary nature of environment studies. **(10 Marks)**

OR

6 a. Explain the concept of ecological pyramid and food chains. **(10 Marks)**

b. Describe grassland ecosystems. What are its types? How conservation of grassland can be made. **(10 Marks)**

Module-4

7 a. Define pollution. Explain the different types of pollution briefly. **(10 Marks)**

b. Discuss the role of an individual in prevention of pollution. **(10 Marks)**

OR

8 a. Define Noise Pollution. List the major sources and effects of noise pollutants. **(10 Marks)**
b. Define air pollution. List the major sources and effects of air pollutants. **(10 Marks)**

Module-5

9 a. Write a note on global warming. **(10 Marks)**
b. What is the need for water land reclamation? Explain the methods for reclaiming waste land. **(10 Marks)**

OR

10 a. Explain how ozone layer depletion occurs. Discuss the importance ozone depletion on human health. **(10 Marks)**
b. Write short notes on:
(i) The water (Prevention and Control of Pollution) Act.
(ii) Environment Protection Act. **(10 Marks)**

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